Punjab Road Report,

FOR THE YEAR 1853-54.

SELECTIONS

FROM

THE RECORDS

OF THE

GOVERNMENT OF INDIA.

(FOREIGN DEPARTMENT.)

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PUNJAB ROAD REPORT,

FOR THE YEARS 1853-54.

Calcutta:

THOS. JONES, *CALCUTTA GAZETTE* OFFICE.

1854.

TABLE OF CONTENTS.

Section I.

Section II.

ANNEXURES.

Section I.

No. 2765 of 1854-55.

From

Lieut.-Colonel R. NAPIER,

Chief Engineer, Punjab,

To

R. TEMPLE, Esquire,

Secy. to the Chief Commissioner for the Punjab, Lahore.

Dated Lahore, 9th September 1854.

Lahore and Peshawur Road.

Sir,

Review of previous proceedings.

In the month of August 1852 I submitted a Report on the Lahore and Peshawur Road. The rough estimate for the road was Company's Rupees 15,48,841-2-0. The road had then been definitely traced, all preparations had been made for carrying it on with vigor, and the openings of the difficult portions had been commenced, and four lakhs of Rupees had been expended. Hopes were then held out, that the difficult Passes, the "Kharian," the "Gedur Gully," and the "Bukrala," would be opened for travellers during the current year 1852, and that the lower parts of the road, in the valleys of the Ravee and the Jhelum, would be opened early in 1853.

Operations during 1853-54.

I shall proceed to show that, notwithstanding many difficulties, these promises have been in a great measure fulfilled.

Regarding the estimate, I must observe, that the original intention was to open, as speedily as possible, a road to Peshawur, to meet the immediate military wants of the country; and that many rough works were contemplated for overcoming difficulties, such as are in use in North America. As our knowledge of the country became more extensive and accurate, as the violence of the floods and torrents became familiar, and as the difficulties of the work came under execution, it became apparent that none but the very best style of works would answer to render the

whole project an efficient continuation of the Grand Trunk Road and an example of the Indian works of the present day, worthy of the reputation of the Indian Government.

The Court of Directors* have pronounced that the work is one of absolute necessity, and every means have been used to hasten its completion in the most durable manner that the skill and energy of the Officers, and the resources of the country could provide. The original rough estimate became no longer applicable.

The progress made in the construction of the road since 1852 is as follows:—

FIRST DIVISION.

FIRST DIVISION.

From the right bank of the Ravee at Lahore to Wuzeerabad.

F. C. Marshall, Esq., Assistant Civil Engineer, in charge.

The length of this Division is fifty-nine miles.

Earth-work.

The whole of the earth-work has been completed.

Masonry.

There are six large bridges; of these there is one of three arches of thirty feet span, and one of one arch thirty feet span.	The whole of these have been completed.
A timber bridge on masonry abutments and piers, originally intended to be of three openings of sixty-five feet span, but subsequently changed to five openings of eighty feet span each, for reasons explained.	This bridge has not been yet commenced, partly from want of an Officer of rather more experience than Mr. Marshall,

and partly because the embankment of part of the bed of the Chenab was likely to cause some change in the water-way.

There are thirty-one drains in this Division, all of which have been completed.

Metalling.

The metalling of part of this Division is a matter of difficulty. Kunkur for metalling is found on the left, but not on the right bank of the Ravee. Indeed, as a general rule, it may be assumed, that in the valleys of the Punjab Rivers no kunkur is to be found,† in the alluvial parts, which have been (geologi-

* See their letter sanctioning the work.

† Kunkur has been lately reported to have been found in the low valley of the Sutlej near Gunda-Singh-wala, opposite Ferozepoor, but locality not defined.

cally speaking) recently subject to the influence of the rivers. This may apply to the part of the First Division between the Ravee and the Bagh Bucha Nullah, and kunkur has therefore to be transported for a considerable distance, partly from the left bank of the Ravee.

Station-houses.

Groves.

Six station-houses have been built for the road establishment at distances of ten miles, and groves of trees have been planted at intervals of two miles along the sides of the road.

Mr. Marshall.

The work of this Division has been on the whole creditable to Mr. Marshall; he has managed to get his work done chiefly by contract, and his accounts are always well brought up and his Office Books in excellent order.

SECOND OR GOOJERAT DIVISION.

SECOND DIVISION.

Lieutenant Gardner, Executive Officer, (on leave.)

Captain Moffat, Officiating.

The length of this Division is forty miles ; of this—

Road or earth-work.	In Plains, thirty-three and a half miles,	Earth-work completed.
	In Hills, six and a half miles, ...	Earth-work, one-eighth of a mile, incomplete.
Masonry work.	Twelve bridges from ten to eighty feet span, ..	Nine finished. Three not commenced.
	Sixty-four drain bridges under ten feet span,	forty-one finished.
Timber bridges.	One bridge 300 feet span, ...	Not commenced.
	One bridge 240 feet span,...	Masonry piers nearly finished ; wood-work in hand.

Road-way.

The great cuttings through the Kharian Pass have been completed, and the road-way of this Division is all but finished and ready for metalling.

Embankment across Valley of the Jhelum.

There remains some earth-work in finishing the slopes of the Kharian Pass cuttings, and a drain bridge not originally provided for. The earth-work of the embankment across the valleys of the Chenab and Jhelum is nearly finished, a solid

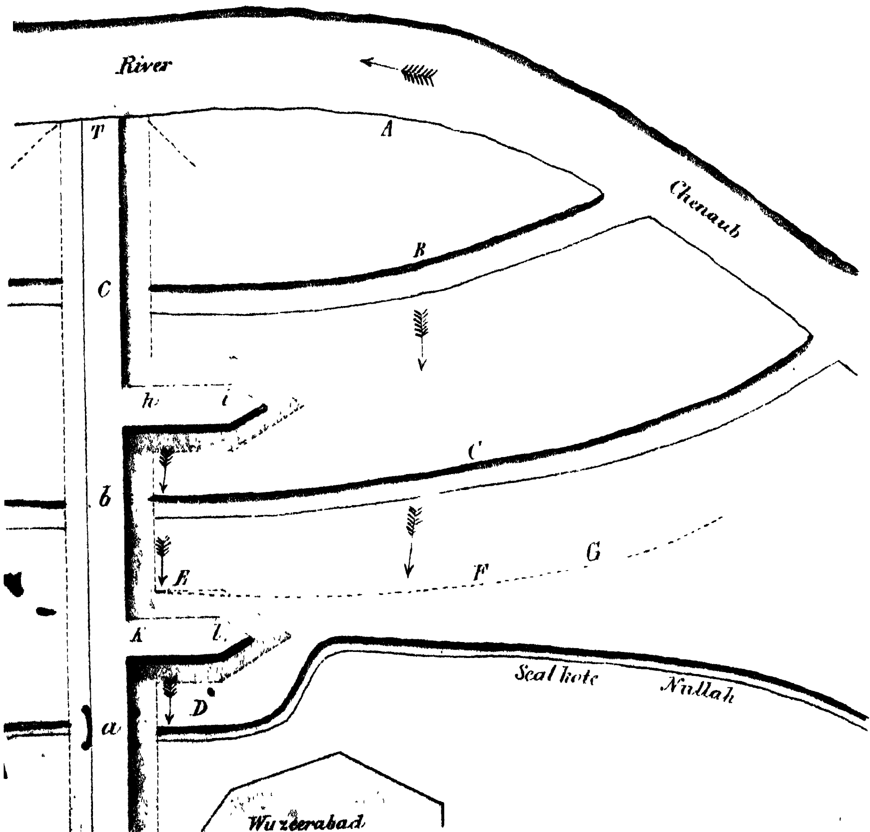
embankment has been carried from "Nourungabad Serai" to the border of the stream of the Jhelum, and its terminus will be protected by a strong line of piling. There is every reason to hope that this work may be considered permanent, as it stood during the last rainy season and is now well consolidated, and the slopes turfed and in course of being further protected by plantations of jhow and willow trees.

Embankment across Valley of the Chenab.

The same work has been executed on the valley of the Chenab. The embankment has been carried for more than a mile and a half across the sandy bed of the valley, and two deep channels, over which it was intended to build bridges, have been to the present time successfully closed.

The portion of the Chenab embankment is as follows :—

Chenab Embankment.



The Sealkote Nullah drains the Rechnab Doab, and in great floods from A to D is inundated.

Chenab embankment.

It was intended to place bridges at A, B and C; but there was always the danger of the channels B and C indefinitely increasing and deepening when confined to fixed water-way; it therefore appeared advisable to close these channels, so that they might silt up, giving some increased water-way to bridge "*a*" and securing its foundation.

The next idea was to run out, to some high ground, a bund, E, F, G, as high as the road, so as to exclude the Chenab water entirely from the Sealkote Nullah.

The occurrence of a minor flood during the time that I was encamped with Lieutenant Taylor at Wuzeerabad, gave us an opportunity to study its effects; there was a strong current along the side excavation of the bund as marked   , which threatened to cut away its slopes. If the bund, E, F, G, should be carried out, the stream would be driven to the terminus of the bund to the Chenab, where it would not be at all desirable to have any action going on. The idea of the bund, E, F, G, was therefore abandoned, and instead, the spur bunds, h, i, k, l, are being run out a few hundred feet, to remove the actions of the streams, B, C, in minor floods, from the road embankment, and push it round into the Sealkote Nullah, the banks of which are comparatively old and firm. There is no doubt that the section of the road embankment is sufficient to support any head of water, which does not overflow it; the only points on which it could be injured are at its extremities, or by being under-mined at the channels of the nullahs B, C. These points will be secured by piling, and as every flood that comes up to the bund deposits nearly an inch of rich alluvium over the land, there is reason to hope that the whole tract for several miles up the river will be completely reclaimed. The well foundations of the Sealkote Nullah Bridge will be sunk as deep as they can be got down, and well secured by a flooring and by curtain walls, and the terminus T will be protected by deep piling.

Well in the Kharian Pass.

There being no water in the Kharian Pass, between Kharian and Nourungabad, except a precarious supply from a tank, a well has been sunk to a depth of 160 feet, and a good supply of pure water is anticipated. The work has been

difficult and hazardous, but it has been successfully accomplished without accident and will prove a great blessing to travellers, as well as a convenience to the road establishment, which could not be dispensed with.

Metalling.

The supply of metalling for this Division has been a subject of much consideration; small quantities of metalling were found at first, but on working out the deposits, they have proved quite insufficient. No beds of kunkur have been met with, although, in order to ascertain the fact, the ground has been surveyed, and at short intervals lines were drawn perpendicular to the road, on both sides, to a distance of ten miles, and on these, wells or pits were sunk at half mile intervals, without discovering a single quarry.

Stone for metalling.

Stone that will answer for metalling is found in limited quantities, at distances of from six to nine miles from the road: the whole of this has been collected at centrical spots, but is still far short of the demand: the remainder will have to be supplied by carrying kunkur across the Chenab from Wuzeerabad for the first march, and large shingles or boulders from the Jhelum and from Bhimbur for the central and Western marches of the road. The expense of this is not determined. The greatest pains will be taken by Lieutenant Taylor for a systematic reduction of the cost of collection, carriage and breaking of the material to a minimum sum. That it will be a very expensive operation there can be no doubt, but having taken every possible means to procure materials as near as possible, by proclamation of rewards and by close search, and having reduced the cost of its preparation to as low a sum as is practicable, I conclude, it must be admitted, that the expense must be incurred and the road metalled.

Materials.

The masonry in the "Kharian" Pass is built partly of good sandstone, principally excavated in the cuttings or quarried near the works. The rates at which it has been executed are Rupees 10, 12 and 13-8 per 100 cubic feet.

Station-houses.

One station-house for the road establishment has been made; three more will be constructed.

Groves.

Groves of trees have been planted along the line of road at distances of every two miles.

Cost of quarrying.

Cost of quarrying, 1¼ Rupee per 100 cubic feet. The causes of this high rate have been explained.

Metalling. Metalling for six and a half miles has been collected.

Earth-work. The earth-work in this Division was quickly done, and Lieutenant Gardner deserves credit for this despatch and for the manner in which he managed to retain work-people.

Masonry. The masonry works are generally very good, particularly the stone masonry. *Office.* The Office was not in efficient order. Lieutenant Gardner had allowed some arrears to accumulate, which may be attributable partly to ill health and partly to difficulty of getting Office Establishment.

THIRD DIVISION.

THIRD OR JHELUM DIVISION.

Lieutenant Oliphant, Executive Engineer.

Lieutenant Warrand, Assistant Executive Engineer.

Lieutenant Hallowes, H. M.'s 87th, Actg. A. C. ditto.

J. Chalmers, Esq., Assistant Civil Engineer.

On Probation.
- F. Lennox, Esq., Assistant Civil Engineer.
- J. Bean, Esq., Assistant Civil Engineer.
- H. Scott, Esq., Assistant Civil Engineer.

The length of this Division is thirty-six and three-quarter miles.

Earth-work.

Road or earth-work in plain ground, fourteen miles.	Finished eleven miles. In hand three ditto.
In hill ground 23½ miles, ...	Finished twelve and a half ditto. In hand six and a half ditto. Not commenced 4 ditto.

Masonry.

Four large bridges, from 200 to 400 feet water-way, ...	Finished, ...	0
	In hand, ...	1
	Not yet commenced,	3

N. B.—Large quantities of materials for the remaining bridges have been collected.

Thirteen bridges, from 12 feet to 100 feet span,...	Finished, ...	6
	In hand, ...	1
	Not yet commenced,	6

Sixty drains, ... { Finished, ... 30
Remaining to be done, 30 }

The building stone is an excellent sand-stone, partly quarried out in excavations and partly drawn from a quarry near Sohawa, where there is a tram-way and trucks at work, by which the carriage is very much economised.

Materials. Stone.

Lime.

Lime of excellent quality, from Rupees 15 to 20 per 100 maunds.

Metalling.

Lime-stone boulders broken, at from Rupees 3 to 2 per 100 cubic feet.

Hard mill-stone grit ditto, 1 Rupee 12 annas to 2 Rupees.

Carriage per 100 maunds at 12 annas a mile, but neither of the above rates can be considered as definitely settled.

Stone metalling.

Stone metalling for seven and a half miles has been collected and broken.

Masonry.

Groves.

The masonry in this Division is of a superior description, owing to the favorable nature of the stone. The bridges are faced with dressed stone. Six groves have been planted, and nurseries have been formed for supplying trees for the other twelve groves required.

Road station-houses.

Four road station-houses will have to be built in this Division; none of them have as yet been commenced.

Difficult nature of works.

This Division has contained the heaviest work of the road. From Jhelum the road runs through flat or undulated ground as far as Hutti, with considerable cuttings and embankments. On approaching the Bukrala Nullah, the cuttings and embankments are very formidable. In order to give a descent of 3 feet per 100, a ridge of 1200 feet broad at the road level must be cut or tunnelled.

Bukrala Nullah Bridge.

The Bukrala Nullah Bridge will be commenced during the next working season. A heavy embankment for the approach to the bridge on the right bank of the nullah is in progress, and the road is thence completed through the Bukrala Hills to the table-land of Potwar, at a gradient not exceeding 3 feet per 100.

Where there are interruptions from the unfinished parts of the road,

Temporary line.

an excellent temporary line has been made, so that the communication is quite open from Jhelum to Sohawa, and thence to the old road at Pudhana.

Bishendour and Heer Nullahs.

The Bishendour and Heer Nullahs, two gigantic ravines, are now the obstacles which prevent the connection of Lieutenant Oliphant's Division with Captain Bowden's; as soon as they are passable, the whole line will be opened for traffic to Rawul Pindee and Hussein Abdal.

The works of this Division have been most formidable, and their execution has been excellent and most creditable to Lieutenant Oliphant, the Executive Engineer, and his Assistants.

Office.

The Office is generally in very good order; some arrears had occurred at the time of my last inspection, owing to the sudden increase of labourers, before establishments for office work and superintendence could be obtained.

Number of work-people.

Lieutenant Oliphant had at one time 13,000 men at work.

Lieutenant Oliphant and Assistants.

The masonry of the bridges and drains is excellent. The district is wild and thinly-peopled, and possesses no town nor city of any consequence, near the works, to aid its resources. The Division, though only a portion of the great work, is in itself a charge of the utmost importance, equal in magnitude to any single executive charge in the country, and requiring engineering talents and energies, which Lieutenant Oliphant possesses in a high degree. He has been ably assisted by Lieutenant Warrand, Engineers, and Mr. J. Chalmers, Assistant Civil Engineer.

The Rawul Pindee Division, comprising the Fourth and Fifth Divisions.

Rawul Pindee Division. Fourth Division.

The Fourth Division is under the immediate charge of Lieutenant Bowden, 22nd Regiment, assisted by Lieutenant Bray, H. M. 96th Regiment. It extends from Rawul Pindee to Goojer-khan-walla, a distance of thirty-one miles; of these there are—

Road or earth-work.

In rocky and difficult ground, thirteen and a half miles, } Eleven miles completed or nearly so; two and a half miles in progress.

In open and undulated ground, seventeen and a half miles, ... } Twelve miles completed or nearly so, five and a half not commenced.

Masonry.

Sohan River Bridge, water-way 1,100 feet, } Excavations for the foundations are commenced.

Stone for bridges.

Stone is being quarried; a tramway well advanced to bring the stone from the quarry to the works; nearly all the wood for the superstructure of the bridge cut and seasoned. The foundations will be under water, with boulders, and will be the principal difficulty.

Leh Nullah Bridge.

The Leh Nullah Bridge, 300 feet water-way, ... } Excavations for the foundations commenced; timber for superstructure ready.

Bridges and drains.

One bridge fifty feet span. In progress—seventy-two bridges, drains and culverts of twenty feet span and under. Of these thirty-five are completed, eighteen in progress, and nineteen not commenced.

Materials.

The masonry is principally built of stone, which is found of good quality throughout the line, and costs from Rupees 2 to 5 per 100 cubic feet.

Bricks.

The bricks are burnt by contract, and cost from Rupees 8 to 10 per 1,000.

Lime.

Stone lime of good quality, costs from Rupees 15 to 18 per 100 maunds.

Metalling.

No satisfactory rate of preparing metalling, nor for carriage, but 1 Rupee per 100 maunds per mile may be assumed.

Road station-houses.

Two road station-houses have been built, and one more has to be constructed.

Groves.

There are to be fifteen groves in this Division. Nurseries have been formed for supplying trees.

Fifth Division.

Fifth Division.

The Fifth Division is under the immediate charge of Mr. Ninian Steele, Assistant Civil Engineer, under the orders of Captain Robertson, and extends from the Chablat

River to Rawul Pindee, a distance of twenty-nine and three-quarter miles; of these there are—

Road or earth-work.

In very rocky and difficult ground, eight and three-quarter miles, ... } In progress.

Undulated ground, with heavy work, cuttings and embankments, sixteen miles; of easy plain ground, five miles, ... } Open and all but completed.

Masonry work.

2*nd*. Large bridges—the "Kala Viaduct," 200 feet water-way; the Vah stream, 180 feet. Foundations of both in progress.

The Bahoodra Bridge, ninety feet, well advanced.

Seal Bridge, forty feet. Fifty bridges, drains and culverts of small span, ... } Well advanced, thirty-eight completed, seven in progress, five not commenced.

Materials.

With regard to materials, the remarks of the preceding Division apply to this Division also.

Road station-houses and groves.

The three road station-houses in this Division are ready. Nurseries of young trees have been formed for planting fifteen groves.

The two Divisions will be open for traffic by the close of the present year, excepting the large bridges.

Bridges over the Sohan and Leh.

The principal points to notice in the Division, are the large bridges over the Sohan and Leh Rivers.

They will be of timber, supported on masonry piers. The timber will be a modification of the lattice bridge, of which a model, on one-half the scale of the bridge, was proved to bear an actual load of upwards of 800 lbs. on each square foot of road-way without breaking. The bridge over the Seal Nullah will be of similar construction.

Sohan Bridge.

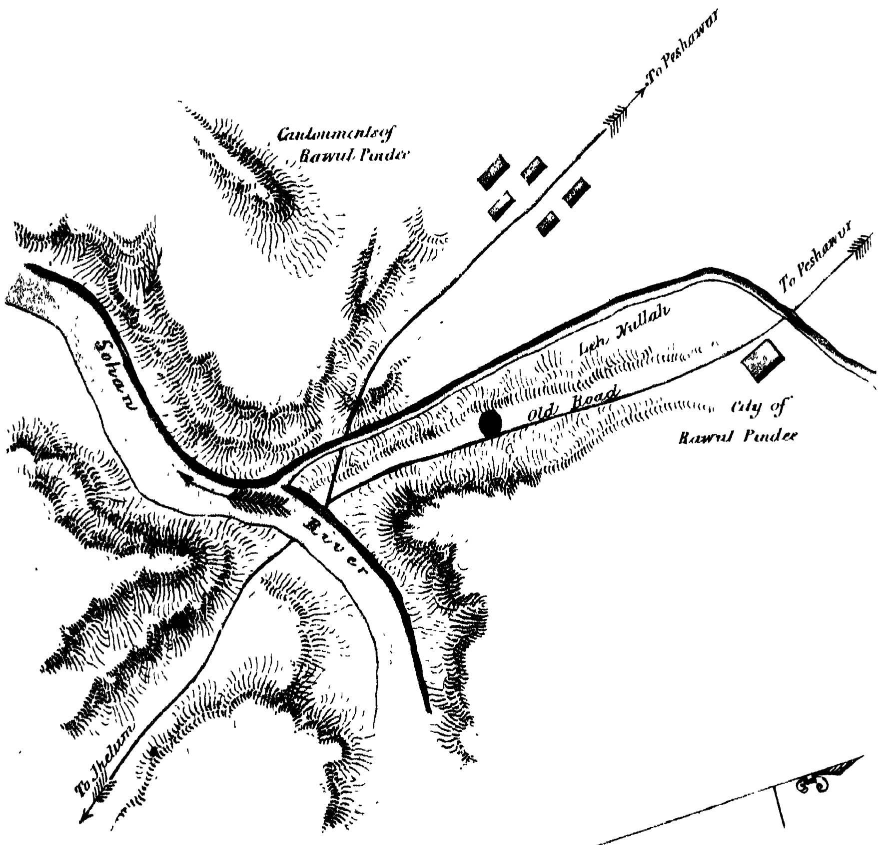
The site selected for the Sohan Bridge, has been chosen after the most careful consideration, above the junction of the Leh Nullah. This entails a bridge over the latter as well as over the Sohan, which is contrary to the ordinary principles of bridge building, as it would have saved the smaller bridge, could the Sohan Bridge have been placed below the confluence of the

two streams. But the only available point is one, a short distance below their junction, and it would have been manifestly objectionable to have had a second stream flowing directly upon the bridge, particularly as the Leh may be in flood when the Sohan is not. The bed of the Sohan shows marks of great disturbance at the confluence of the two streams. The position of the Sohan Bridge was therefore fixed at a safe distance above it, incurring the necessity of a second bridge over the minor stream, to obtain the most secure position for the greater work.

The great descents to the Sohan from Rawul Pindee and Rowat Serai are well advanced.

The position of the Sohan Bridge is favorable to the city of Rawul Pindee, the direct road to which runs on the left bank of the Leh.

Crossing of the Sohan River.



The new passage through the Margulla Hill is now being opened; the company of Sappers is encamped on the work; the great ravines on each side of the Pass are embanked and passable.

Margulla Pass.

The general supervision of these two Divisions, the Fourth and Fifth, making the Rawul Pindee Division, has been exercised by Captain Robertson, of the Madras Native Infantry. During Lieutenant Oliphant's absence on sick leave, in 1852-53, Captain Robertson had charge of the Sohawa works, where he did valuable service, his present Division having nearly been at a stand for want of an experienced Engineer. Under Captain Robertson's management the works were steadily organized and advanced satisfactorily.

Captain Robertson.

Lieutenant Bowden, (H. M.'s 22nd,) Executive Officer, Fourth Division, and Mr. Ninian Steele, Assistant Civil Engineer, in charge of Fifth Division, have given very great satisfaction. Lieutenant Bray, Captain Cobbe, and Captain Ring have assisted on the works and have been favorably reported of. Captain Robertson's Division is scarcely, if at all, inferior to the Third, or Lieutenant Oliphant's Division, in the magnitude and importance of its works, to the execution of which Captain Robertson has brought the experience gained during an employment of some years in the Madras Presidency and a large share of professional skill and talent.

Assistants.

SIXTH DIVISION.

Sixth Division.

Lieutenant Henderson, Executive Officer.

Lieutenant Anderson, H. M.'s 96th, Assistant Executive Officer.

Lieutenant Packe, 4th N. I., Acting.

Lieutenant Tovey, H. M.'s 24th Regiment, Acting.

The Sixth Division commences at two miles East of Akora and extends to the River Chablat. It has the crossing of the Indus and Hurroo Rivers.

The length of the Division is thirty-five miles; of these nine miles are Trans-Indus and twenty-six Cis-Indus.

Road or earth-work.

Of rocky ground and hills at the crossing of the Indus, with great cuttings and embankments, four miles, ...	Completed.
Of clay, ravines and deep cuttings at the crossing of the Hurroo, four miles,...	Two and a half completed. One and a half not yet commenced.
Of undulating country, alternately moderate embankments and cuttings, twenty-seven miles, ...	Four miles completed. Twenty-one and a half miles in progress.

Masonry works.

Four large bridges of 300 feet, 250 feet, 200 feet, and 125 feet water-way, ...	Of these the Hurroo Bridge, of 300 feet, is in progress. Materials for other bridges collected.
Seventeen bridges, from twenty to ninety feet span, ...	Of these 11 are completed and six are in hand.
One hundred and twenty-two bridges, culverts and drains below twenty feet span, ...	Of these fifty-five are completed, and twelve are in hand.

Materials.

Building stone is of rough shape, but good quality; the fracture irregular; its cost ranges from Rupees 2 to 4 per 100 cubic feet.

Lime.

Lime is burnt near the works from mountain lime-stone and is of excellent quality; it costs Rupees 12 to 16 per 1,000 maunds.

Bricks.

Bricks are burnt by contract and cost from Rupees 8 to 12 per 1,000.

Metalling.

The metal will be of broken lime-stone, rate not yet sufficiently determined.

Bridges.

The bridges are constructed of good rubble masonry, the facings rough dressed, the arches of picked stone. The cement of lime and soorkee is of good quality. The bridges between Attock and Lieutenant Gully's Division, have their foundations laid in water; the road runs at the foot of the Geedur Gully Hills, the slopes of which stand in the Cabul River. The beds of the

water- courses have a great fall and undergo much disturbance in floods, and have required the protection of deep curtain walls.

Road station-houses.

One road station-house is ready, and two more will have to be made.

Groves.

Seventeen groves will be planted. Nurseries have been formed for supplying the requisite trees.

Road across the Valley of Peshawur to the plain of Chuch.

The very difficult portion of the road leading from the open Valley of Peshawur, across the Indus, to the plain of Chuch, will be completely open for traffic of all kinds in the current month. It has been delayed by heavy floods, which caused the destruction of two arches by carrying away their centreings.

Plain of Chuch.

The undulated plain of Chuch, extending to the Hurroo, has many small culverts, cuttings and embankments, but is not a work that will take very long to get through, when labor can be fairly applied to it. Hitherto the labor has been absorbed in the heavy work at the crossings of the Indus and the Hurroo.

State of Office.

Lieutenant Henderson's Office was in very good order, and books very well kept up. Some slight arrears existed, owing to the want of Office Establishment.

Lieutenant Henderson.

Lieutenant Henderson has gained valuable experience in his present works, which he has superintended since the 10th April 1851, and which have been of a novel and varied nature.

His Assistants.

The construction of upwards of seventy boats for the Peshawur District, has been entrusted to him in addition to his proper duties. He has constructed the very efficient boats for the Indus Floating Bridge, and is a talented and most zealous Officer. He has been assisted by Lieutenant Packe, of the 4th Native Infantry, Lieutenant Anderson, of H. M.'s 96th Foot, (of whom he reports very favorably,) and lately by Lieutenant Tovey, of H. M.'s 24th Foot.

Seventh Division.

Seventh Division.

Lieutenant Gully, Executive Officer.
Lieutenant Colls, H. M.'s 32nd Foot, Assistant.

The Seventh Division extends from Peshawur to Demgurzaee, two miles East of Akora, a distance of thirty-four miles. The sections and tracings of this part were done in 1851, but the services of Lieutenant Gully being urgently required on another part of the road, the Seventh Division was not proceeded with until December 1853; and until the present working season, workmen were very scarce. It was found necessary to resort to considerably increased rates for labor, which after some time have brought a respectable working party.

Extent of Division.

Scarcity of workmen.

Mr. Brereton's scheme of employing Muzbee Sikhs was tried, and has given a body of 1,000 men, who have worked steadily for some months.*

Employment of Muzbee Sikhs.

Road or earth-work.

Of thirty-four miles, there are in level or undulating ground, twenty-seven miles; in broken ground and ravines, seven miles, ..	Twenty-two miles completed; twelve miles in progress.

The masonry in this Division is extremely heavy.

Four bridges, from 180 to 300 feet water-way, ...	Of these, one of 300 feet completed.
Thirty-three bridges above twenty feet of water-way, ...	Six in hand.
Ninety bridges, culverts and drains under twenty feet span, ...	Twelve completed; ten in hand.

Materials have been collected for all the remaining bridges and for twelve bridges in excess.

The line runs between and nearly parallel to the Khuttuck Hills and the Cabul River, and intercepts the whole drainage flowing from the former to the latter. There is no choice of ground, so that the masonry works are necessarily very numerous. The drainage channels are wide and little sunk below the surface, so that bridges require numerous piers and arches of small height.

The foundations of the larger bridges are laid below the water level.

* The Muzbees have since been ordered to be withdrawn from the Peshawur Valley, because part of them joined some outlaws on the frontier. They are a serious loss to the works.

Building stone is quarried on the Noushera Hills and boated across the Cabul River. It is also quarried in the Khuttuck Hills and is of good texture, but irregular fracture; costs on an average Rupees 6 per 100 cubic feet.

Materials.

Bricks.

The bricks are burnt by the Executive Engineer, and cost Rupees 10 per 1,000.

Lime.

The lime is burnt in the Khuttuck Hills, and is of good quality; it costs Rupees 12 per 100 maunds.

Metalling.

The metal will be of broken stone, boulders and shingle; its cost is not yet sufficiently determined.

Road station-houses.

There will be three road station-houses in this Division; they have not yet been commenced on.

Groves.

Nurseries have been formed for supplying trees for the groves along the road: there will be sixteen of these groves.

Cause of delay in progress of the road.

From the cause before noted, namely, the temporary removal of Lieutenant Gully, the attention which the more important parts of the road demanded, and the want of some experienced Officer to superintend the work, this Division has been the latest commenced and will probably be the latest completed.

Auxiliary works.

The auxiliary works of the road are, a saw-mill at Mungola turned by water power. It is in excellent working order, and turns out ordinarily 2,000 superficial feet of timber per diem, though it can, if required, saw more than 3.000 feet.

Saw-mill at Mungola.

The return from it is reckoned at 30 to 40 per cent. on its outlay. The mill stream is taken from the Jhelum and the waste water will be thrown off for irrigation.

Timber-yard and work-shops.

Attached to the saw-mill are the timber-yard and work-shops for the supply of tools for the road and the construction of the bridge of boats for the Jhelum.

Work-shops, &c. at Rawul Pindee.

Work-shops at Rawul Pindee and apparatus for boiling timber, in lieu of seasoning; store-room and office for the Superintendent and Executive Officers.

Saw-mill, &c. at Attock.

At Attock, a saw-mill driven by water-wheel work-shops and building yard for boats for the River Indus, store-rooms, &c.

Tram ways have been laid down for the transport of stones from the quarries at Sohawa to the works, also from the quarries of Rawul Pindee to the Sohan Bridge.

Tram ways at Sohawa and Rawul Pindee.

Nearly the whole of the transport of earth from excavations, or for embankments, has been done by means of wheel-barrows or horse-carts. Excepting in the two lower divisions, the use of baskets has entirely ceased.

Transport of earth.

The bridge of boats over the Ravee has been completed and in use since October 1853. The estimate provided for a cold weather bridge of fifty boats and a ferry for the season of inundation, the boats being all adapted for ferry boats. During the present year, (a season of very unusual floods,) the bridge has been maintained the whole time,* but twelve boats, in addition to those estimated, sixty-two boats in all, have been found necessary. To allow of a few to spare, the complement should be seventy boats for the Ravee.

Floating bridges.

Bridge of boats over the Ravee.

For the Chenab fifty boats are estimated, twenty-five boats have already been despatched, and thirty-six more will be ready by the 1st of September. When the bridge will be established, probably not less than 100 boats will be required for the Chenab, which should be bridged permanently throughout the year.

Chenab bridge of boats.

For the Jhelum, fifty-eight boats estimated for are ready, and fifty more should be built, and may be ready by the 1st of January next, to bridge the river at all seasons. The cold weather bridge may be put up in October, or as soon as the floods cease.

Bridge of boats over the Jhelum.

For the Indus, fifty-five boats were estimated for all seasons; thirty boats are ready for the cold weather bridge, which will be put up as soon as the floods cease, and twenty-one more are in progress.

Indus bridge of boats.

Thus the four rivers will have the cold weather bridges ready as soon as they subside, in the course of two months, and if sanctioned by the Government, a sufficient num-

Summary.

* Since writing this, the communication across the bridge has been stopped for a day, by a high flood turning the East flank of the bridge, but the moorings remained firm.

ber of boats to maintain bridges on every river throughout the year, will be prepared during the cold season.

Description of bridges.

Each bridge has a road-way tweny-six feet broad, divided into two streets, for the going and coming traffic. The following equipment is in course of being supplied for them :—

224 Anchors.

233 Chain Cables.

Equipment from England.

The Indian arsenals and markets could not supply the following, which are coming from England by order of the Court of Directors :—

9 Chain Cables,	... ...	For the Ravee.
9 Anchors,	... ...	
38 Anchors,	... ...	For the Jhelum.
35 Chain Cables,	... ...	
60 Chain Cables,	... ...	For the Chenab.
10 Chain Cables,	... ...	For the Indus.
43 Anchors,	... ...	

There have been received from magazines the following anchors and cables :—

41 Anchors,	... ...	For the Ravee.
31 Anchors,	... ...	For the Jhelum.
43 Cables,	... ...	
60 Anchors,	... ...	For the Chenab.
2 Anchors,	... ...	For the Indus.
35 Cables,	... ...	

Length of road open, work performed and remaining, &c.

The total length of the road is,... ...		264 Miles.
Of which there are now passable and in use, ...	160	220 „
And will be open in November next, ...	60	
Remaining, ...		44 Miles,

which are mainly in the Seventh Division, which, from the great number of bridges and culverts required, and from having been, as I have before noted, the latest commenced, will be the last completed.

Forty miles, First Division open for traffic, 11th February 1853.
Twenty miles, ditto ditto, 16th July 1853.
From the Chenab to Kharian, open 10th May 1853.
Kharian Pass open for travellers, December 1852.

Mail Carts commenced to run from the Ravee to Jhelum, ...	Oct. 1853.
Road from Jhelum to Deenah and through Bukrala Pass, open......	12th Nov. 1853.
Bukrala Pass open for travellers, ...	Nov. 1852.
Twenty-five miles of Fifth Division, open ..	July 1854.

Abstract of the Work already done on the Road and that remaining to be executed.

Work done and remaining.

DESCRIPTION OF WORK.	Required.	Completed.	In progress.	Remaining.	REMARKS.
Masonry & Timber Bridges,	103	33	16	54	Materials collected for almost all the unmade bridges.
Drains and Culverts,... ...	489	242	47	200	
Road Station-houses, ...	26	13	...	13	
Groves, ...	130	55	...	75	Nurseries formed for the remaining Groves.
Tunnel, 624 feet long, ...	...	...	...	1	
Metalling, ...	Materials collecting in First, Second and Third Divisions.				
Saw Mills, ...	Two at work.				
Floating Bridges, ...	New Floating Bridges will be put up on the Indus, Jhelum and Chenab by November, and one has been maintained all the year on the Ravee.				

Past expenditure.

The following is an abstract of the expenditure on the whole road up to the 1st February 1854:—

Expended up to 1st December 1853.	Sanctioned Establishment, ...	Rs. 1,45,566	0	0
	Temporary Ditto, ...	„ 1,47,823	0	0
	Road Work, ...	„ 9,15,029	0	0
	Tools and Stock, ...	„ 2,62,000	0	0
	Outstanding Balance, ...	„ 1,62,000	0	0
		16,32,925	0	0
Expended, and Balance in hand from 1st December 1853 to 1st February 1854, ...		8,33,075	0	0
	Total, Company's Rupees ...	24,66,000	0	0

Future expenditure.

Annexed to this Report is an estimate* of the probable cost of completing the road, excepting the metalling in the Sind-Sagor Doab and Peshawur, and not including the cost of superintendence, amounting to Company's Rupees 26,74,661-0-3. The rates of the estimate are fair and as low as is consistent with good work.

Labor tasked.

The greatest pains have been taken to establish systematic rules for the exaction of labor. The task of each man has been calculated for every kind of soil, the most economical means of transport have been adopted from experiment, and every expedient that could be devised has been practised to reduce the cost of labor. Borers of large diameter have been used to pierce the hard clay for mines, when shafts and galleries were inapplicable.

Estimate how formed.

In order to arrive at an approximate estimate of the probable cost of completing the road, a total of the water-way required for the bridges was made and divided by the number, to give a mean section, for which the several parts were calculated, and the masonry thus obtained was estimated at Rupees 20 per 100 cubic feet, including centreing and plastering. This process was applied to the Fourth, Sixth and Seventh Divisions. The remaining masonry work was deducted from detailed calculations, and from actual cost of similar works, with rates increased to cover the increased rates of labor which it has been found necessary to give. The earth-work

* *Vide* Table, No. II.

has been calculated from a complete profile of the line, which accompanies this Report. The blue line represents the road-way, on which the gradients are shown.

Metalling.

The data for metalling in the Sind-Sagor Doab are not yet to be relied on. The rates for laying down metal are shown in the accompanying Table,* but the cost of collecting, breaking up, and consolidating, are not yet fixed.

Wages.

It has been found necessary to increase the wages considerably beyond the rates current at annexation, particularly in the Divisions beyond the Jhelum, where they have increased 50, 75 and 100 per cent. The progressive rise of prices may be seen in Table, No. VI., which contains comparative statements of rates of labor and works.

Tables I. III. and IV.

The other Tables that are forwarded with this Report are :—

Table, No. I, showing the amount expended on the road to 1st May 1853.

Tables Nos. III. and IV., showing the quantity of work that is fixed as a task for one man, and the labor of carrying for given distances.

Difficulty of procuring labor.

There has, at times, been very great difficulty in procuring labor, which has delayed the works. The country beyond the Jhelum being bounded on two sides by hills, the population of which will not work in the plains, or only do so for a few months, the labor is drawn mainly from the agricultural population of the Sind-Sagor Doab, who return to their homes at the season of ploughing and harvest; and during the Ramzan festival, which lasts from a portion of May to a portion of June, scarcely any work is done, so that the strength of the working parties is liable to great fluctuations, whilst the establishment of superintendence must be maintained.

Plentiful labor during last cold season.

In the cold season of 1853-54, during a temporary alarm for the harvest, the population of the Sind-Sagor Doab flocked in great numbers to the works. It was of great consequence to them that they should find employment, and an advantage to the road not to be lost.† Every effort was made to provide tools and superintendence, advertisements were issued for Overseers, and sanction was obtained from Government for the employment of Soldiers

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* *See* Table, No V.

† No reduction of rates was practicable at this period, because the people came great distances on the report of the labor prices, and a reduction would have given rise to an imputation of bad faith and seriously injured the credit of the works.

Road establishments and work-people.

from H. M.'s Regiments. Additional Assistant Executive Officers were also appointed, and uncovenanted Assistants on trial. The following is a statement of the establishment and work-people employed on the road:—

Superintending Establishment.

Period.	Supdg. Officers.	Executive Officers.	Assistants.	Assistant Overseers.	Overseers.	Remarks.
Cold Season of 1853-54, ...	1	* 6 Commissioned Officers, 2 Uncovenanted ditto, ...	7 Commissioned Officers, ... 2 Uncovenanted A. C. E., ...	......	80	* Inclusive of Captain Robertson.
June and July 1854, ...	1	* 6 Commissioned Officers, 2 Uncovenanted ditto, ...	9 Commissioned Officers, ... 4 Uncovenanted A. C. E., ...	....	80	

Working Establishment.

Period.	Coolies and Mates.	Masons, Carpenters, Blacksmiths, Bheesties, &c. &c. &c.	Animals.	Attendants.	Hackeries.	Remarks.
Cold Season of 1853-54,	35,051	39,66	1,655	154	4	...
In June and July 1854,	26,215	4,635	912	89	...	...

But on the occurrence of heavy rains the laborers rapidly diminished.

Superiority of daily hired laborers over monthly servants.

Several thousand workmen have been sent from the Cashmere Hills and from the Cis-Ravee and Sutlej, but it is found better and cheaper to pay very much enhanced rates for daily labor than to bring up from a distance monthly servants, who generally try and give as little return as possible for their wages; and failing to turn out a fair task of work have their pay cut, and soon desert or withdraw from their engagements.

The present rainy season has been unusually severe in the Punjab, and

Injury caused by recent heavy rains.

Damage to the Bagh Bucha Bridge.

serious injury has occurred in one or two parts of the road. The Bagh Bucha Bridge, of three arches of thirty feet span each, has been washed away, and the road has been breached in several places in the First and Second Divisions, where it was not expected. It is so far fortunate, that this has occurred during the construction of the road and whilst the means of guarding against a re-occurrence of it are at hand.

The embankments will be raised and additional water-way given.

It is almost impossible to learn the extent of some of these floods, except by experience. The alteration or obstruction of a torrent, near the hills, whose streams flow in a shallow channel, may double the flood in an adjacent line of drainage.

Extent of hill floods difficult to know.

I will give an instance in the Bhimbur Nullah, which flows near Goojerat. We found the road crossing it three times, and esteemed ourselves fortunate in getting a direct line, which crossed it only once at a good section. There were traces of an escape from the nullah, from some point higher up, which had once crossed the new line, but was nearly grown over and obliterated, and it was thought well to secure it by embanking the part where it left the main channel. From some change in the nullah a large part of the stream suddenly returned to the old and nearly effaced channel, and it seems difficult to say which of the two the river will eventually adopt. Both must be bridged with the full water-way. The water has not sufficiently subsided to admit of ascertaining the cause of the loss of the Bagh Bucha Bridge, of which a full Report shall be submitted hereafter. The materials were good and the water-way sufficient.

Instances in the case of the Bhimbur Nullah.

Amidst such difficulties a correctly detailed estimate is almost impossible, without an additional establishment that could not easily be procured, and a delay for which the estimate would afford no compensation.

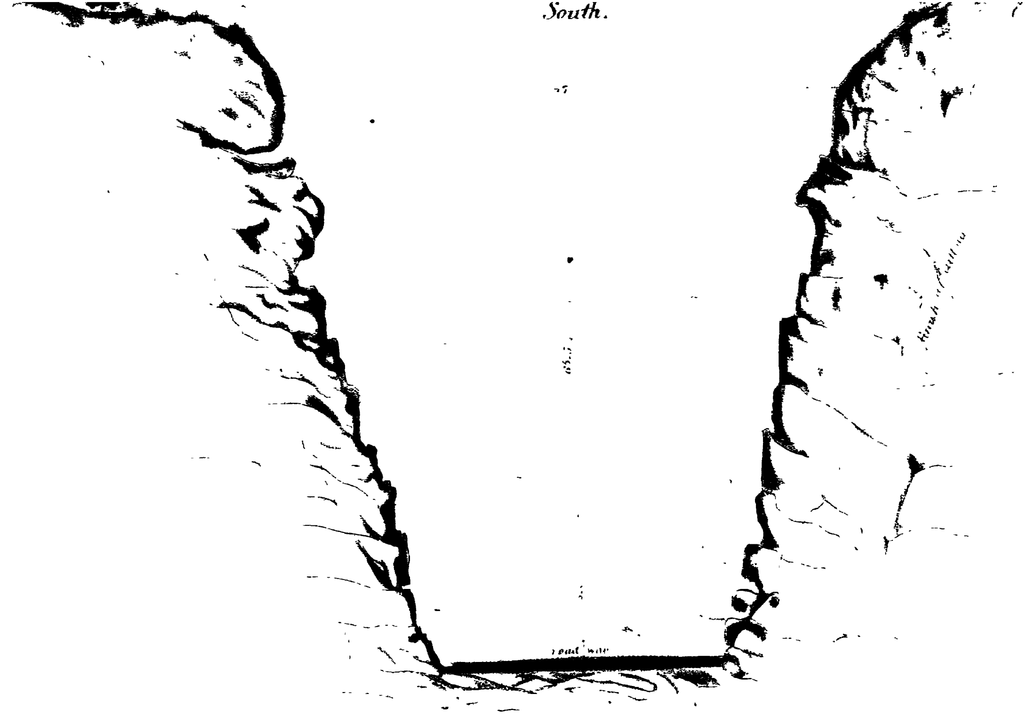
Difficulty of forming correct estimate.

The foregoing Report, though giving the general state of each Division, does not give an adequate idea of the mass of work which has been performed. The heaviest works are the embankments in the valleys of the Ravee, Chenab and Jhelum, the cuttings through the Kharian Hills, the ascent from Deenah, in the valley of the Jhelum, to Huttee, where there are many low hills to cut through and ravines to embank. The descent to the Bukrala Nullah and ascent to Sohawa, are works of great magnitude, to explain which, I have annexed a few sections. The Sohawa cuttings are through very hard rock. At the borders of the Third Division, the Bishendour and Beer ravines are gigantic, and the crossings of them at easy gradients are great works, and are, at present, obstacles to a complete connection of the new line between Jhelum and Rawul Pindee.

Chief works and greatest difficulties on the roads.

Between these and the Sohan River, the country is comparatively easy, but there are many long cuttings and fillings with culverts. The excava-

South.



Scale 20 ft to 1 Inch

about 60 feet in length of this cutting remains to be completed

Chief Engineers Office Lahore
August 54 Copy No 52.

Sd A. Robertson Captain Ex. Officer
3d Dn L & P Road Dd Sohawah 16th Sep

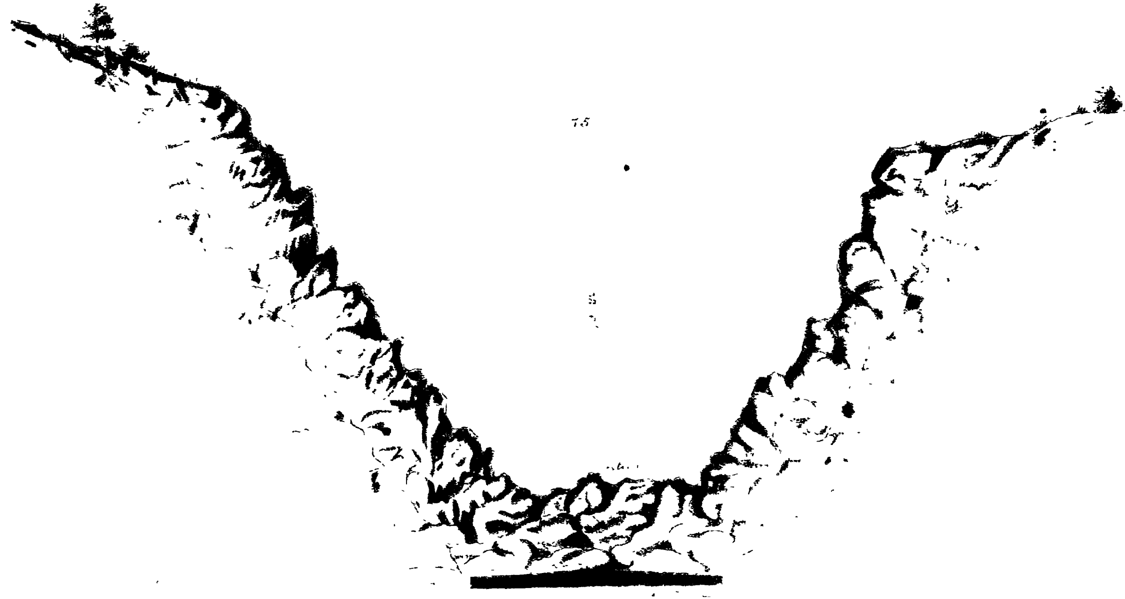
C. Napier Lieut. Col.
Chief Engr of the Punjab

J. Black, Lithr. at the ... Press

SUKRA CUTTING



BUKRALLA CUTTING



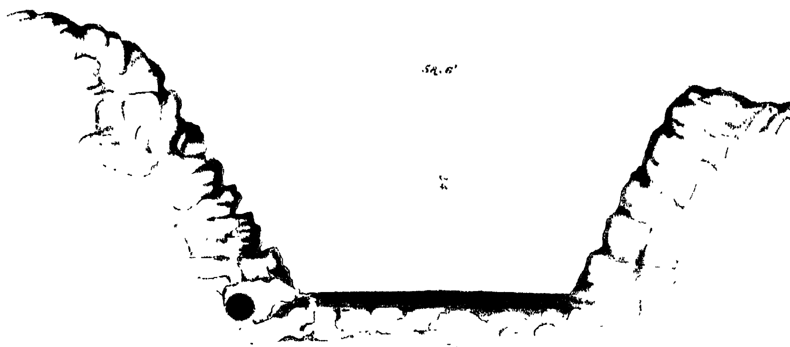
(Signed) J Robertson Captn Ex. Offr 3d Dn L&P Road
Dd 16th Septr 1852 Sohawah.

R. Napier Lieutt Coll.
Chief Engr of the Punjab

Chief Engrs Office Lahore Augt 52
Copy No 93

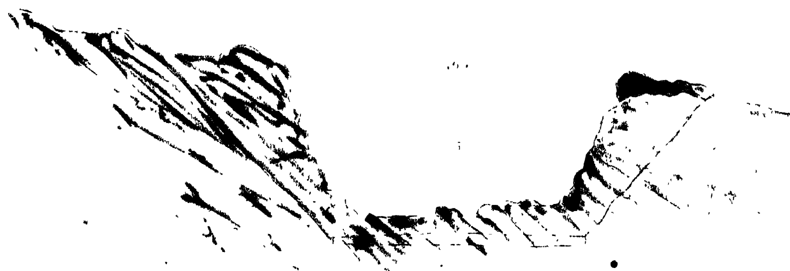
Scale 20 ft 1 Inch

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Small Sohawah Cutting Sohawah

Side, North



Chenkie Hill Cutting

Scale 20 Feet to 1 Inch

Chief Engineer's Office
Lahore August 18
Copy No 91

(Sd) A Robertson Captn.
Exe Offr 3rd Dn L&P Road

Lieut Col.
Chief Engr in the Punjab.

tion and embankments for crossing the Sohan are second only in magnitude to those of the Bukrala Nullah; the Margulla Pass, a passage blasted through the hardest lime-stone rock; the crossing of the Hurroo, scarcely inferior in extent through in easier soil than the Sohan. The crossing of the Indus, with the rocks which bind it on either side, has been a formidable work. The annexed sketch shows the Khoond cliff, the face of which was blown away for the road-way in 1851 (as noted in my last Report) at the expense of 18,000 lbs. of powder.

Lieutenant Taylor, Superintendent.

Lieutenant A. Taylor, of the Engineers, the Superintendent of this road, has maintained the same zeal and energy in its construction that marked his commencement of it. With matured experience and increased resources, he has devoted his talents to the work amidst great difficulties. He has introduced improvements in mining, by the use of very large jumpers, wielded by the help of mechanical agency. The use of gunpowder in the great excavations of clay has been followed with success. He has vastly improved the construction of the boats for the Indus and Jhelum Rivers, both in form and mode of construction. I beg to recommend him to the favorable consideration of the Punjab Government.

Mr. J. Anderson, Assistant Civil Engineer.

Mr. J. Anderson, Assistant Civil Engineer, has been attached to Lieutenant Taylor's office, the management of which has been entrusted to him, and for which Lieutenant Taylor reports highly in his favor.

Other Officers of the road.

Lieutenant Oliphant, of the Engineers, (who has been the longest employed,) Lieutenant Henderson, and Captain Robertson, have all had executive charges of the greatest importance, and deserve to be specially recommended. I also beg to recommend Mr. Ninian Steele, Assistant Civil Engineer, Lieutenant F. J. Gully, and Mr. F. C. Marshall, Assistant Civil Engineer, who deserve great credit. Lieutenant Packe, Lieutenant Colls, Captain Cobbe, Captain Ring, and Lieutenant Hallowes, have been favorably reported to me. Captain Moffat, who has acted for Lieutenant Gardner, has given satisfaction, and Lieutenant Taylor has desired to retain his services. Lieutenant Warrand and Mr. J. Chalmers, Assistant Civil Engineer, have both given valuable assistance, and deserve to be very favorably recommended.

Section II.

Road from Lahore to the Beeas.

State of the road in August 1852.

In August 1852, the road from Lahore to the Beeas, *viâ* Umritsur, had two-thirds of the earth-work thrown up, twenty bridges and culverts were completed, and a considerable part of the metalling was collected. Nurseries of trees had been planted and shelter provided for the road establishment.

Road now completed.

Since that date, the whole road has been completed, as far as was provided for in the estimate, with a few trifling exceptions, and has been maintained in constant use from the Beeas to Umritsur since its commencement, and from Umritsur to Lahore since July 1853.

Chief Engineer's inspection of the line from Umritsur to the Beeas.

I carefully inspected the whole line in April last. From the Beeas to Umritsur the line was in excellent order, excepting in the following instances. The gradients from the high bank to the bed of the Beeas had not been sufficiently provided for in the original estimate, and required a further expenditure of about Rupees 5,000 to cut an easy descent.

Metalling of road next the Beeas.

The mile of metalling next the Beeas had just been laid down, when there was a heavy fall of rain, and at the same time a sudden influx of heavy-wheeled traffic, which injured the evenness of the surface.

Bridge washed away.

A bridge partially constructed had been washed away by a flood coming at an unusual season and carrying away the centreings. An examination of the locality showed it to be rather more economical to cut a new channel, for the torrent, to the Beeas, so as to prevent it crossing the road at all.

Trial of the metalling laid down.

In order to exhibit the metalling thoroughly, its thickness and consolidation, the Executive Officer (the late Captain Lamb) caused to be cut out of the road-way, before me, at intervals taken at hazard, solid blocks of the metalling, which, though so recently laid down, came out in compact slabs, which were transported unbroken for fifteen or twenty miles, showing an excellent

consolidation. The quantity of metalling estimated for was sufficient for a good substratum, nine inches of metal laid on the road were beaten down to five and five and a half inches. The metalling has an excellent hard surface, which will stand the wear and tear of traffic for another year or two, and give a good foundation, on which a super-layer will be thoroughly consolidated. In examining a part of the metalling, where the surface had been picked up and a two-inch layer laid down, the two layers had become thoroughly incorporated with each other, forming one uniform stratum.

Collection of metal for super-layer.

It will be necessary to commence immediately the collection of metal for the super-layer, so that it may all be laid down in the course of the next twelve months.

Road from Umritsur to Lahore.

From Umritsur to Lahore the road was also in excellent order, with these exceptions. The slopes of the embankments wanted a little finishing, and the metalling, for a a few miles between Attaree and Lahore, was inferior to the rest, from the very bad nature of the kunkur procurable within a reasonable distance. I directed the abandonment of the indifferent quarries and the transport of kunkur from a greater distance.

In every other respect, the road was in excellent order, every masonry work is in sound condition and of excellent quality, and the water-ways sufficient for their work. The plantations at every half-mile were complete and in good order.

Length, cost, &c. of road.

The whole line of road is sixty-two miles long. It has thirty-five bridges and drains, 35,145,386 cubic feet of embankment, and 5,068,800 superficial feet of metalling.

The amount of the original estimate is, ...	Rs.	2,65,342	13	8
The total cost of work executed is, ...	„	2,67,253	7	7
Expended in excess of Estimate, ...	Rs.	1,910	9	11

But of the above sum expended, Rupees 16,266-3-8 were for earth-work, found necessary, and ordered in addition to the estimate, so that Captain Lamb has actually executed his work Rupees 5-6-7 per cent. under his estimated rates.

Estimate,...				2,65,342	13	8
Expended,	2,67,253	7	7			
Deduct,..	16,266	3	8			
				2,50,986	3	11
Actual expenditure under estimate, ...				14,356	9	9

The following are items of expenditure not included in the estimate:—

Executive Officer's salary, ...	11,700	0	0	Expenditure not included in Estimate
Subordinate Superintendence, ...	21,877	8	8	
Guards and Surveying Estabt., ...	3,365	3	11	
Instruments, ...	1,294	0	5	
Tools and Work-shops, ...	5,241	13	9	
Experiments, ...	60	14	4	
Stationery Contingencies, ...	112	11	5	
Repairs to the Road embankment after rains, to preserve it for traffic during three years, *i. e.* from Feb. 1851 to May 1854,...	20,673	10	2	

	64,325	14	8
Expenditure for work on the road, ...	2,67,253	7	7
Present total cost of road, ...Rupees	3,31,579	6	3

The additional works required on the road are—

Additional works necessary.

Small drain bridge to sundry cross roads and at the entrances to the road-side, thannas, police chowkies and encamping grounds, to prevent the drainage from being impeded,	8,000	0	0
Expenses of the new channel for the torrent alluded to, to prevent its crossing the road, ...	13,285	5	8
An additional embankment for ditto, ...	2,097	5	4
Improving the incline to the bed of the Beeas, ...	4,308	8	0
Estimated cost of upper coat of metalling, ...	82,255	0	0
	1,09,946	3	0
Cost up to present date, ...	3,31,579	6	3
Rupees	4,41,525	9	3

Total cost of road.

The total cost, therefore, of the road from the Beeas to Lahore, including every contingency, will be about Rupees 4,41,525, or Rupees 7,121 a mile.

Guards.

It is to be noted, that the unusual contingency of guards is added to the cost of Punjab works.

It gives no idea of the probable cost of a road, to confine the estimate to the mere labor on the works, over and above which the repair of the road, and maintaining it for traffic during construction, will cost about 6 per cent. The ordinary contingencies of superintendence, tools and stock amount to about 11 per cent., and the extraordinary contingencies, such as accidents, additional works, &c., amount to about 7 per cent., so that a mere first calculation of expenses of working up the embankment and masonry and metalling should have 25 per cent. added to it, to cover all charges.

Cost of road how to be estimated.

The Officer who superintended the execution of this work, Captain J. C. Lamb, died on the 24th June last. It is due to his memory to record his very meritorious services. His works show every mark of the greatest pains and diligence, and are in every way satisfactory, as having been economically and quickly executed.

Captain J. C. Lamb.

His accounts were kept with the greatest accuracy and always up to date. In little more than a month he manufactured and put up the posts for the Electric Telegraph, for which his bills are already passed by Government.

The charge of completing the road has been entrusted to Captain Faddy, the Executive Engineer of Govindghur.

Completion of road entrusted to Captain Faddy.



ROAD FROM THE BEEAS TO PHILLOUR.

From the termination of the road from Lahore to the Beeas, the road *viâ* Jullundur to Phillour on the Sutlej, has been partly made by the District Local Committee. The road has been partially metalled, and latterly a grant has been made by Government for continuing it by an embankment across the Eastern side of the valley of the Beeas.

Road from the Beeas to Phillour.

This work is in progress. The Local Committee's line was made to deviate from a direct course, in order to touch at Phugwara, and Kurtarpoor; the latter, a small Cavalry station, has since been abandoned, and the Officer (Captain Gordon, H. M.'s 75th Foot,) lately appointed to take charge of the road, reports unfavorably of the circuitous line

of the Local Committee, which, not being properly raised and bridged, would save little in a continuation of the Grand Trunk Road if carried on the same line.

It therefore appears desirable to leave the Local Committee's line for present use, during the construction of the new line, and to carry the continuation of the Grand Trunk Road in a direct line from Phillour, passing close by the South of the city and cantonment of Jullundur, and striking the valley of the Beeas at Dyalpoor, where the new embankment commences. Captain Gordon is engaged in making a full Report on this subject, which he will submit with surveys and profiles of both lines, to be well considered before a final recommendation can be made, but, in either case, the cost of the road will perhaps equal that of the road from the Beeas to Lahore, *viz.* including every charge connected with it, salaries, surveying, &c. &c. Rupees 7,121 per mile, or Rupees 3,56,050 for the whole road.

It is highly desirable that sanction should be obtained to take up the ground, throw up the earth-work, and prepare materials on which ever line may be determined upon, during the ensuing working season, so that a year may not be lost.

Captain Gordon has one Assistant Executive Officer, and will require one more, at least, to carry on the work vigorously.

Road from Lahore to Ferozepoor.

The road from Lahore to Ferozepoor, though much wanted, has not been commenced, because no competent Officer has been available ; now that the road from Loodianah to Ferozepoor has been nearly completed, the Executive Engineer of that work may turn his attention to the Lahore and Ferozepoor Road. Much of the earth-work might be thrown up during the ensuing cold season, and materials might be commenced, pending the preparation of an estimate.

The road from Lahore to the Beeas will have cost, when quite finished, including every charge for salaries of Superintending Officers, surveying, &c., about Rupees 7,121 a mile, and the road to Ferozepoor will probably cost 20 per cent. more, owing to the increased drainage and the unfavorable nature of the country between Kussoor and the Sutlej for forty-five miles, or probably Rupees 3,84,534.

Road from Lahore to Mooltan.

Road from Lahore to Mooltan.

The road from Lahore to Mooltan had been opened in 1852, and in constant use for wheeled traffic; during the rains, the road not having been bridged, the mail-cart ceases to run for the letter-dawk, for a few months, though used by travellers. Ordinary wheeled traffic continues on the road without intermission.

There are several parts of the line, which are inundated, as was to be expected, and Government have sanctioned the expenditure of a sum of Rupees 36,522-1-1 for embankments and drain bridges, to remedy the parts which offer positive obstructions. But many miles of the road are through a sandy soil and require metalling. The traffic on the twenty miles out of Lahore is so heavy, that metalling there is absolutely required.

Taking into account the importance of the line as a connection between Lahore, the capital, and Mooltan, the "port" for Bombay, the consideration of measures for making it a permanent line, cannot much longer be deferred. The want of engineering means prevented its being undertaken on a more extensive scale than that which has been adopted, and which has been of the greatest utility. A belief also, that it would be one of the first lines for a railway, on the navigation from England to Kurrachee and Mooltan being more opened, together with the poverty of the country it traverses, have prevented its being brought forward as a permanent line.

The additions and improvements sanctioned, were commenced after careful surveys in April last, and were to have been executed by the District Officers with the assistance of Mr. Assistant Civil Engineer Bond.

Six important Lines of Road.

1. Jhelum to Kalabagh, *viâ* Chukowal.
2. Mooltan to Sealkote, *viâ* Jhung, Ramnugger and Wuzeerabad.
3. Mooltan to Jhelum, *viâ* Jhung.
4. Dehra Ishmael Khan to Lahore, *viâ* Shahpoor and Pindee Bhutteean.
5. Dehra Ishmael Khan to Ubohur, *viâ* Jhung and Googaira.
6. Attock to Kamokee, on the Grand Trunk Road, *viâ* Futtehjung, Chukowal, P. D. Khan, and Ramnugger.

The six important lines mentioned in my last Report, and now noted in the margin, have been traced. No. 5, from Dehra Ishmael Khan, *viâ* Shahpoor and Pindee Bhutteean to Lahore, has been completed, on a grant of Rupees 21,651-4-0 from the general revenues, and estimates aggregating

Rupees 2,03,435-5-8 have been submitted to the Honorable Court of Directors for sanction for the remainder. Pending their reply, the roads have been partly opened by the District Officers, and await the amount of the estimate for completion.

SPECIAL GRANTS FOR ROADS.

For the following roads, special grants have been given by Government:—

Rawul Pindee to Chukowal.

1. The road from Rawul Pindee to Chukowal has been surveyed and traced by Lieutenant Nightingale and his Assistants, and opened by the Deputy Commissioners of Rawul Pindee and Jhelum. The distance is twenty-two and one-third miles, and the sum expended on it Company's Rupees 5,203-8-2.

Rawul Pindee to Khooshialgurh.

2. The road from Rawul Pindee to Khooshialgurh has been surveyed and traced, and is in progress. It is a branch of the Rawul Pindee and Kalabagh road, from which it strikes off at Futtehjung. Its length from Futtehjung to Khoshialgurh will be forty-seven miles, of which ten are made. The amount sanctioned for it is Rupees 15,750. This does not include bridges which are indispensable, and will be estimated for separately.

Khooshialgurh to Kohat.

This highly important road completes the communication from Rawul Pindee to Kohat. From the Indus to Kohat the road has been made by Lieutenant Garnett, Executive Engineer of Kohat. A flying bridge should be maintained at Khooshialgurh.

Ferozepoor to Googaira.

3. From Googaira to Ferozepoor, a distance of seventy-five miles, the road has been made at a cost, granted from the general revenues, of Rupees 20,240, and wells have been sunk at every stage. This is a very valuable line and is now much used. It was opened by the Deputy Commissioner of Googaira, Mr. G. Lance, and by the Deputy Commissioner of Lahore, Mr. J. Wedderburn.

Trab to Torbeila and Derbund, along the left bank of the Indus.

4. The road from Kalabagh, along the left bank of the Indus, passing by "Khooshialgurh" and "Attock" to Torbeila and Derbund, is more properly a frontier line, but as the grounds on which its sanction has been obtained, had more immediate reference to the police and fiscal management of the "Sind-Sagur" Divisions, I mention it here as one of the important lines for which grants have been given from the general revenue.

Small parties of men from the Affreedie and Khuttuck Hills, either natives or outlaws from our provinces, have occasionally crossed the Indus on inflated hides, and committed daring, though petty marauds in the Sind-Sagur Doab, occasionally carrying off a traveller for ransom, and baffling all pursuit in the impervious country which borders the river. It is to repress this evil that the road is most urgently required, but it will also do much to improve that very wild country, which is now nearly closed to all but robbers and sportsmen and its rude inhabitants. It will also be most valuable as a communication with Kalabagh, so that heavy goods or stores may be transported from Bombay by water to Kalabagh, and if too late, or too early for the water carriage to Attock, will have means of proceeding by land for the rest of the journey. Even were the Indus open for all seasons between Kalabagh and Attock (which I hope may be effected) a parallel road would be indispensable.

Road from Trab to Torbeila.

The line has been surveyed, and a sum of Rupees 46,605 has been granted for its construction, which will be undertaken during the ensuing cold season.

5. A road to the new station of Dalhousie, in the Chumba Hills, will be a continuation of the road from Lahore to Puthankote. It will be about forty miles long and have a gradient of three feet per hundred where practicable, but will, in no case, exceed four feet per hundred. It has been surveyed and partly traced by Lieutenant Dawson and Lieutenant Battersby, of H. M.'s 60th Regiment, and a temporary road is in progress, which it is hoped will give access to the new station during the present working season, when the buildings for the Military Depôt may be commenced.

Road to Dalhousie.

Roads made by District Officers.

Table, No. VII., which is appended to this Report, shows the roads executed by the District Officers since annexation ; such of the roads as have been traced by the Civil Engineer's Department are noticed.

Roads made by District Officers.

I beg to report that the following District Officers appear to have made the best and greatest number of roads, and by the care they have bestowed to have them made according to the uniform sections furnished from the Civil Engineer's Office, have given the greatest and most valuable assistance :—

In the Umritsur District, Mr. C. B. Saunders, Deputy Commissioner, has made 169 miles of very good road.

In the Googaira District, Mr. G. Lance, Deputy Commissioner, has made 102 miles of good road, besides sinking masonry wells.

In the Sealkote District, Mr. J. Inglis, Deputy Commissioner, has made 244 miles of good road.*

In the Goojerat District, Mr. B. Sapte, Deputy Commissioner, has made 73¾ miles of very good road.

In the Lahore District, Mr. Wedderburn, Deputy Commissioner, has made 120 miles of good road on the prescribed section.

In the Jhelum District, Captain C. Browne, Deputy Commissioner, has made 184 miles of very good road.

Lithographed standard plans for drain bridges and culverts.

I am glad to have an opportunity of mentioning the exertions of these Officers, for the durability of the roads, as well as their appearance, depend greatly on the pains bestowed to adhere to the proper sections laid down for them. A set of standard plans of drain bridges and culverts has been prepared in this office and lithographed for distribution amongst the Civil Officers to aid them in bridging their district roads: a complete set of copies accompanies this Report.

ROAD FROM RAWUL PINDEE TO MURREE.

Road from Rawul Pindee to Murree.

From Rawul Pindee to Murree, the sanatory station for the Sind-Sagur Doab and Peshawur, a road has been opened, partly by the District Officers and partly by the Civil Engineer's Department, as follows:—

Length, &c. of road.

		Miles.
1.	From Rawul Pindee city to Mullpoor, ...	10½
2.	„ Mullpoor to Salgiroun,...	13
3.	„ Salgiroun to Murree, ...	16½
	Total distance from Rawul Pindee to Murree, ...	40 Miles.

Width.

The width of the road in the plains and undulating ground is, ...	40 feet.
In the low hills, ...	20 feet.
And in the mountains, ...	12 feet.

And 8 and 6 feet at precipices.

* All these roads are made on Section No. 2.

The road is at an easy gradient, never exceeding four feet per hundred, and has cost Rupees 41,944-6-11 ; but there are a great many bridges and drains to be completed.

Description.

The road is one of great value as a military road to the Murree Depôt and to the hilly part of Maharajah Goolab Singh's Territory, to the Eastward at Kotelee, and gives a good road for a great part of one of the direct outlets from Cashmere. When connected with Abbottabad, in Huzara, by a proposed road, it will give a great command over that wild country.

Use and advantages.

The progress of the road has been slow, owing to a scarcity of laborers, but it will be substantially completed.

Progress.

Much of the road has been superintended by Lieutenant C. Dowson, H. M.'s 8th Foot, who has executed it satisfactorily.

Lieutenant C. Dowson.

Military Roads.

Under this head I shall class all the frontier roads beyond the Indus and the roads in Huzara, though there is hardly one of them that will not act as beneficially in facilitating commerce and civilizing the country, as in enabling our troops to coerce it if necessary.

Military roads.

The accompanying sketch of Huzara shows the general distribution of the roads proposed and commenced, the red lines being those proposed and the yellow those in progress. They are so arranged as to give one main line, leading from the Lahore and Peshawur road, where it first enters the plain of Huzara, and running through the principal central valley of Huzara, which is in fact the great highway to Cashmere, it throws off a branch to Mozufferabad, in the direction of that country. The main line preserves its course up the valley, leading to Khagan, as far as Balakote, the remotest assemblage of houses that can be called a town, and the scene of the fatal defeat and death of the fanatic, Syud Ahmud, who was slain, with nearly all his followers, in that secluded valley, by Maharajah Shere Singh.

Huzara roads.

From Balakote to Khagan, the road has been surveyed, but the result was so unfavorable from the difficult nature of the country, that the

improvement of the old existing track, and not the construction of a regular road, has been recommended.

This main Huzara road splits the country into two pretty equal parts, leaving between it and the Jhelum, on the South and East, the Mouchpooree and Murree chains of mountains, forming the " Dhoond" country, which will be thoroughly penetrated by the road from Rawul Pindee to Murree, its continuation to Kotelee and Dewal, and a branch road over Mouchpooree to join the main Huzara line at the station of Abbottabad. On the North and West the tributary valleys of Boghurmung, Agrose, Shinkiaree and Puklee, will be penetrated by branch roads from the main Huzara line, striking off at Mansera. These lines, together with others, from the main line at Manghul and Abbottabad, respectively, to Torbeila and Umb on the Indus, will penetrate the mountains of Sherwan and Turnoul.

A great branch, leaving the Lahore and Peshawur road at the Western lip of the Huzara Valley, at Hussein Abdal, will give the most immediate entrance to the heart of Huzara from the Westward, by the route of Hurreepoor and Shunguree. A road from Hurreepoor to Torbeila will enable the Huzara force to concentrate on Eusufzaee.

It has been happily said, that roads will be more efficacious than bayonets in preserving the tranquillity of Huzara. Government have most liberally sanctioned these roads, amounting to 603 miles, as per annexed list, and they are being carried out as fast as the scarcity of engineering means at my disposal will permit. Lieutenant Morrison, a zealous and promising Officer, of H. M.'s 22nd Regiment, has made the road from Kala Surai to Abbottabad, passing near the new cantonment of Scind, Hurreepoor (the fort and capital,) and the " Dohur" Valley, and ascending in the " Sulhud" Pass, about 800 feet to Abbottabad, the head civil and military station. This part is fifty-four miles long, has nearly all the small water-courses bridged, and the larger ones sloped down. A cart can travel to the foot of the Sulhud Pass, the opening of which is delayed by some difficult rocks.

From Abbottabad the line has been traced to within a short distance of Mozufferabad, and opened out to a width of six and eight feet, and an Officer has been appointed for its construction under Lieutenant Nightingale's direction. The total length traced from Abbottabad to Hubbeeboolla is twenty-nine miles, at a gradient of four feet in the hundred. The distance completed is twenty-two miles.

Lieutenant Nightingale has carefully surveyed the line from Murree to Abbottabad, but owing to the difficult nature of the country a satisfactory line has not yet been determined on.

Of Lieutenant Nightingale's Assistants, Mr. Wilson only has been at his disposal, Messrs. McRae and Bond having been detached to the Sind-Sagur Doab and Mooltan roads. More assistance must be given him during the ensuing cold season. His labors have been arduous, as well as those of his Assistants, Messrs. Wilson, McRae and Bond, and I beg to recommend them to the favorable notice of the Punjab Government. Lieutenant Morrison has also given great satisfaction.

List of Roads in Huzara, the construction of which have been sanctioned by Government.

Number.	Description of Road.	Route.	Length.	Cost per Mile.	Total Cost.		
1	Main Line, 40 feet wide in plains, and 20 feet in hills.	Kala Surai (or Grand Trunk Road,) Oosman Khatir, Siria, Hurreepoor, Abbottabad, Manseera, Budrasee, Gully, Gurbee, Hubeeboolla, and Balakote. 1. Branch from Manseera, to Shunkiaree. 2. Branch from Hubeeboolla to Mozufferabad. 3. Branch from Hurreepoor to Hussein Abdal, ..	142	1000	142000	0	0
2	Ditto, ..	Torbeila to Umb, ..	22	..	13640	0	0
3	Gun Road for Horse Artillery, 12 feet wide, ..	Torbeila to Manseera by Barookote and Powar, ..	35	500	17500	0	0
4	Ditto, ..	Hurreepoor to Hoond by Kote, Shein Gully, and Pehor Ferry, ..	35	300	10500	0	0
5	Gun Road for Horse Artillery, 12 feet wide,	Sheregurh to Manseera by Gully and Jungee, ...	25	500	12500	0	0
6	Ditto, ...	Agrore to Manseera by Soorsul Gully, ...	24	300	7200	0	0
7	Ditto, ...	Abbottabad to Murree and Dhunnah, ...	40	1000	40000	0	0
8	Bridle Road, 8 feet wide, ...	Hurreepoor to Khanpoor and Rawul Pindee, ..	30	300	9000	0	0
9	Ditto, ..	Shunkiaree to Agrore, by Jehree Ahl in Koush and Khuthail, ..	30	200	6000	0	0
10	Ditto, ..	Shunkiaree to Balakote *viâ* Koonhar direct, ...	15	300	4500	0	0
11	Ditto, ...	Balakote to Khagan Proper,	58	200	11600	0	0
		Carried over, ...	456	4600	274440	0	0

List of Roads in Huzara, the construction of which have been sanctioned by Government.—(Continued.)

Number.	Description of Road.	Route.	Length.	Cost per Mile.	Total Cost.
		Brought forward, ...	456	4600	274440 0 0
12	Bridle Road, 8 feet wide, ...	Hurreepoor to Manghul by Shunguree and Powee, ...	30	200	6000 0 0
13	Ditto, ...	Hurreepoor to Dhunnah, ...	30	200	6000 0 0
14	Ditto, ...	Abbottabad to Umb by Sherwan, ...	40	300	12000 0 0
15	Ditto, ...	Shunkiaree to head of the Boghur Mung Valley, ...	25		
		Ahl to head of Konch, ..	12		
		Aghee to head of Agrore, ...	10		
				200	9400 0 0
		Total,... ...	603	5500	307840 0 0

ABSTRACT.

	Miles.	Cash.
Main Roads, ...	164	1,55,640 0 0
Gun Roads, ...	159	87700 0 0
Bridle Roads, ...	280	64,500 0 0
Total,......	603	3,07,840 0 0

Roads in the Peshawur Valley.

Roads in the Peshawur Valley.

The Government has sanctioned the execution of a complete scheme of roads for opening out the Peshawur Valley, as enumerated in the following list :—

Number.	Kind of Road.	Name of Road. From	Name of Road. To	Distances. Miles.
1	Principal Military Road	Peshawur, ...	Michnee, ...	14
2	Ditto, ...	ditto, ...	Shubkudur, ...	15
3	Ditto, ...	Shubkudur, ...	Abazaee, ...	8
4	Ditto, ...	ditto, ...	Michnee, ...	8
5	Ditto, ...	Peshawur, ...	Murdan and Central Eusufzaee, ...	33
6	Patrolling Road, ...	Murdan, ...	Naoshera, ...	14
7	Ditto, ...	ditto, ...	Turungzaee *viâ* Khair Khumaee, ...	18
8	Ditto, ...	Khair Khumaee	Tungee, ...	14
9	Ditto, ...	Murdan, ...	Sheregurh, the entrance of Ramzaee, ...	15
10	Ditto, ...	ditto, ...	Loondkhwar, ...	13
11	Ditto, ...	ditto, ...	*Viâ* Kullung to Kahow, at the head of the Loondkhwar Valley,... ...	19
12	Ditto, ...	ditto, ...	Head of the Loodhum Valley, ...	18
13	Ditto, ...	ditto, ...	Pehoor Ferry, ...	36
14	Ditto, ...	Goombutt, ...	Jehangeera and Attock,...	13
15	Ditto, ...	Abuzaee, ...	*Viâ* Pulli, Loondkhwar, Katling, Chargolie, Shewa and Swahee, ...	78
16	Ditto, ...	ditto, ...	Sheregurh *viâ* Tungee, ...	20
17	Ditto, ...	Branch lines,..	In the Loondkhwar Valley,	16
			Total Miles,...	322

For this purpose the following establishment has been appointed:—

1 Assistant Executive Officer.

2 Overseers.

4 Native Surveyors.

The Assistant Executive Officer has also charge of the ferries on the lines of military road, as detailed in the margin.

1 Over Cabul River, on Road No. 1.
2. Over Abazaee „ on ditto.
3. Over Cabul „ on Road No. 2.
4. Over Abazaee „ on ditto.
5. Over Swat „ on Road No. 3.
6. Over Cabul „ near Tulwundee.
7. Over „ „ at Naoshera.
7. Ferries.

The aid of the Officers of the Guide Corps will be given in the ensuing cold season for tracing the patrolling roads in Eusufzaee, and to aid in this purpose four sowars of the corps have been under instruction at Lahore for the last eight months, and promise to become useful.

The scarcity of labor, the hot weather, and the occurrence of the Ramzan festival, during which little work is done, have prevented much progress in these roads, but materials have been collected and operations will be pushed on more rapidly in October.

The amount expended on these roads, from 1st March 1854, the date on which Lieutenant Hamilton commenced operations, to the end of April, has been as follows:—

MONTHS.	Salary.			Contingencies.			TOTAL.		
March, 1854, ...	210	5	3	241	9	4	451	14	7
April, 1854, ...	416	0	0	869	5	4	1,282	5	4
Total, ...	626	5	3	1,110	14	8	1,737	3	11

ROADS IN THE KOHAT DISTRICT.

Kohat and Bunnoo road.

The Kohat and Bunnoo road passes by the fort and salt mines of Bahadoor Kheyl, a distance of fifty miles, and thence by the Soorduck Pass descends to the valley of Bunnoo. The total length of the road will be about seventy-eight miles, of which thirty-eight and a half miles are completed in the most difficult parts, and six miles are in progress. Eleven masonry bridges have been built on the line at an expense of Rupees 11,358-8-5. The road was commenced by order of the Governor-General in the working season

of 1851-52, and has cost Rupees 41,967 or about 1,090 Rupees a mile, a very moderate rate.

Kohat and Khooshialgurh road.

The Kohat and Khooshialgurh road has already been alluded to in connection with its continuation from the Rawul Pindee and Khooshialgurh line. Its total length will be thirty-two miles, of which twenty-nine are completed in a very creditable manner, and have cost Rupees 18,977-13-10. Three masonry bridges have been constructed on the line, at an expense of Rupees 1,780-4-8.

Road from Kohat to the foot of the Kothul.

From Kohat to the Kothul, overlooking the Kohat Pass, a distance of five miles, the road was originally commenced in 1849, and suspended in consequence of the treacherous attack by the Affreedees on the Sapper working party. It is now completed, and has cost Rupees 6,275-9-3. It is the most difficult portion of the road from Kohat to Peshawur, and is a work of necessity.

Road from Kohat to Hungoo.

Roads in the Kohat District.

The road from Kohat to Hungoo opens the communication through the Shookheyl, Machina, Shamulzaee and Hungoo Valleys and the Khooaja Kheddur Pass, and passing near the Shah salt mines, leads to Meerauzaee, a tract of country containing many large villages, inhabited by a fierce race, who are tributary to Kohat. Being pressed by still more warlike tribes from without, they have sought British protection, and a road is equally necessary to give access to their country, in order to protect them and prevent their being driven in upon our frontier by their more powerful neighbours, or to coerce them in case of they themselves committing aggressions.

The road will also be very useful for kafilas from Afghanistan and will tend to pacify and civilize the people. The line is twenty-eight miles long, it has been surveyed and traced, and four miles of the most difficult parts are in hand. It will cost Rupees 64,240 ; about 12,000 have now been expended.

Lieutenant Garnett.

All these Kohat roads have been traced and executed by Lieutenant Garnett. It is not easy to give a just idea of the obstacles in carrying out works in the country surrounding Kohat ; labourers are very scarce, the country difficult, and though it has much improved, work has to be carried on under the protection of armed escorts. Under these difficulties Lieutenant Garnett has made very good roads, which he could not possibly have done without the possession of hardihood, temper and good judgment.

FRONTIER ROADS.

Frontier roads.

A notice of the frontier roads from Bunnoo and Dehra Ishmael Khan, to the frontier of Scinde completes the roads of the Punjab. The annexed Table, No. VIII. shows the several roads and their total length. Most of the Bunnoo roads were made at an early period of our rule, by the Political Officers, and are generally very good, though narrow. They are not shown in this return, there being no report of them.

One complete frontier line extends from Kusmore, the borders of Scinde, to Bunnoo, and joins the Kohat road. It connects all the frontier military posts, and each of the Trans-Indus cantonments. Asnee, Dehra Ghazee Khan, Dehra Ishmael Khan and Bunnoo are connected by lines of road with their respective out-posts. A central road, running between the Indus and the frontier line, directly connects the towns of Dehra Ishmael Khan, Dehra Futteh Khan and Dehra Ghazee Khan with Asnee, and the Scinde frontier is in progress.

It is intended to connect with the central line, and with the principal military posts and towns, the several ferries on the Indus. In pursuance of this, roads are in progress, from—

Asnee to Mithankote.

Dehra Ghazee Khan to the Indus.

These frontier roads are roughly made. The soil is light in dry, and very spongy in wet weather. The country has a considerable slope at the foot of the hills. Every channel is dammed across that the people can manage, and the water turned off by a curious succession of embankments, so as to spread it over as great an extent of country as possible. Whilst the dams hold, the surplus water is thrown down every low line in the ground, and must cross the roads, which, if not bridged, would be breached somewhere, or if impervious, would deprive cultivators of their only chance of a crop. When the bunds break, the whole torrent returns to its natural channel. The result of this system is, that the country is full of water lines, which must be bridged, and of undecided river channels, often nearly empty, and at times flooded, but not giving a fair indication of their discharge. Thus the construction of permanent roads in the Derajat is liable to great uncertainty, and requires the attention of a good Engineer. Unless embanked and bridged, they will require extensive repairs, and in many cases renewal annually ; but as the resources of the country are scanty, the completion of the roads must be a work of time.

In the Upper Derajat, the roads were made by the late Captain Fitzgerald, of the 12th Bombay Native Infantry, and Commanding 5th Punjab Cavalry, who acted also as Executive Engineer. Those in the Lower Derajat were surveyed and traced by Lieutenant Hutchinson, Engineers, and executed by the Commandants of the Irregular Force, Major Prendergast and Captain Jacob. To all of these Officers I feel greatly indebted for their very valuable aid. Lieutenant Hutchinson has been obliged to proceed to Europe on Medical Certificate, but I hope will again return to the Punjab with restored energies. Captain Fitzgerald died from the effects of fever contracted in the Derajat; he was an Officer of rare accomplishments and energy. Major Prendergast and Captain Jacob gave their zealous assistance to the works, without any hope of the remuneration which the Governor General has since been pleased to grant them.

General Remarks.

Principles on which lines were laid down.

In the lines which traverse the whole country, combining the properties of a district line with those of a line for external commerce, differences of opinion have occasionally arisen with the District Officers, who, viewing the roads merely as they affect their districts, desire that they shall deviate from the district lines to touch at large villages, whilst the Engineer, looking to the whole work, wishes his road to touch merely at towns of importance, having a direct course between them. This will be regarded with some temporary disfavor, as the people like to retain their old accustomed halting-places; but it should be remembered, that the line must be made with reference to its general utility; that as means permit, embankment and bridging will be given, which should not be wasted on circuitous routes, which may hereafter be condemned; and that though the people of the immediate neighbourhood may, for a time, prefer their old routes, if the new ones are made equally convenient, by the sinking of wells at halting-places, and receive the fostering care of the District Officers, they will very soon obtain their due value, and supersede the old tracks to the saving of distance to the traveller and the ultimate benefit of the district.

Advantages resulting from the roads made.

It would be needless in the present day to enumerate the advantages which are conferred on a half-civilized country by opening good roads. But it may not be uninteresting to note a few of the practical results which may already be seen in the Punjab. The production and use of wheeled carriage has rapidly followed the roads. Numbers of carts may now be seen penetrating the

" Barr" of the Googaira district, where they had fallen into disuse for many years, and the produce of those lately profitless wastes now finds its way to the markets of Lahore and Umritsur. To travel from Lahore to Mooltan before annexation, was a matter of serious consideration and a fortnight's march; it is now an easy trip of thirty hours in the express carts, and a familiar journey to natives in the " ekkas," of which some hundreds now ply for hire at Lahore and Umritsur.

Nearer the frontier a carriage can now drive into the heart of Huzara, where, not long ago, the natives of the country alone could find their way by a difficult bridle-path.

Beyond the Indus, our border enemies adopt our roads for their kafilas, and it may be truly said, that every step they take over a good road, and in a well-ordered country, is a slow but sure one towards making them more civilized and better neighbours.

In conclusion, I beg to give a summary of the progress made in the Punjab roads:—

Summary of Punjab Roads.

Description of Roads.	Open for traffic.	In progress.	Surveyed.	Traced.	Amount expended.		
Trunk roads, open, or to be opened by 1st November next, ...	282	44	...	...	2797579	6	3
Important main lines for Military and Commercial purposes,	1123	482	...	...	175394	13	8
Military road, ...	705	95	...	...	215391	13	7
Roads for internal communication,	1490	213	...	...	212381	6	3
Roads surveyed and traced by Lieutenant Nightingale and his Assistants, of which part is since Report of 1852, ...	...	...	2736	827	20608	15	5
	3600	834	2736	827	3421356	7	2
Amount of Advances and Balances in Treasuries, and expended between 1st February and 30th April 1854, ...	...	...	...	...	1278370	14	3
Total, Company's Rupees,...	...	...	...	...	4699727	5	5

I have the honor to be, &c.,

(Signed) R. NAPIER, *Lieut.-Colonel,*

Chief Engineer, Punjab.

Chief Engineer's Office, Lahore,
The 9th September 1854.

TABLE, No. I.

Lahore and Peshawur Road.

Detailed Statement showing the Expenditure incurred on Works up to 1st May 1853, with quantity of work executed and average rates.

Nature of Work.	Quantity of Work executed.	Average Rate.	Expenditure incurred.	Grand Total.	Remarks.
	First Division.				
Earth-work,	2,32,35,281·00 cubic feet,	2·066 per 1000	48018 7 11		
Masonry,	1,47,128·50 ditto,	11·65 per 100	17150 9 1		
Excavation for Foundations,	48,983·87 ditto,	3-0-0 per 1000	146 15 3		
Temporary Shelter,	3 Chowkies, complete with Out-offices,	336·74 each	1010 3 7		
Godowns,	4 Godowns for Materials,	51·23 each	204 15 4		
Work-shops,	3 Work-shops of small sizes,	129·67 each	389 0 2		
Groves,	20 Groves laid out and prepared,	56·5 each	1136 13 3		
Marking out Encamping Grounds,	Now transferred to the Civil Authorities,	.. .. ..	19 15 3		
Clearing Berm of Road,	To render passable for Mail Carts.	.. .. ..	512 6 6		
Repairs,	To Earth-work & temporary Shelter.	.. .. ..	53 9 6		
				68642 15 11	
	Second Division.				
Earth-work,	2,46,78,377·50 cubic feet,	2·414 per 1000	59576 10 7		
Excavation for Foundations,	2,14,705·00 ditto,	3·25 per 1000	697 12 8		
Masonry,	99,504·00 ditto,	15·216 per 100	15141 3 3		
	Carried over,	.. .. ..	75415 10 6	68642 15 11	

LAHORE AND PESHAWUR ROAD.—*(Continued.)*

Nature of Work.	Quantity of Work executed.	Average Rate.	Expenditure incurred.	Grand Total.	Remarks.
	Brought forward,	.. .. ..	75415 10 6	68642 15 11	
	Second Division.—(Continued.)				
Metal stacked on Road,	40,976·01 cubic feet,	8·11 per 100	3322 11 7		
Ditto ditto at Quarries,	55,155·00 ditto,	1·20 per 100	661 13 9		
Temporary Shelter,	3 Chowkies, with Out-offices, complete,	540·48 each	1621 7 2		
Godowns and Work-shops,	Two sets of buildings,	106·88 each	213 12 4		
Clearing Berm of Road,	To render passable for Mail Carts,	.. .. ..	882 5 2		
Catch-water Drains,	On the upper sides of Cuttings,	.. .. ..	3 12 0		
Miscellaneous Earth-work,	Regulating courses of Nullahs, and making earthen Bunds, to form Tanks,	.. .. ..	6731 4 9		
Repairs,	To Earth-work and temporary Shelter,	.. .. ..	72 13 1		
Turfing Embankments,	....	.. .. ..	217 15 0		
Trial Pits for Foundations,	....	.. .. ..	78 8 8		
Expenditure during the months of February, March and April 1853, for which detailed accounts not yet received,	....	.. .. ..	36133 12 3		
				125355 14 3	
	Third Division.				
Earth-work, including blasting in rock,	1,51,42,669·75 cubic feet,	4·63 per 1000	70126 9 0		
Masonry,	1,40,386·09 ditto,	12·13 per 100	17026 12 2		
	Carried over,	.. .. ..	87153 5 2	193998 14 2	

Lahore and Peshawur Road.—(*Continued.*)

Nature of Work.	Quantity of Work executed.	Average Rate.	Expenditure incurred.	Grand Total.	Remarks.
	Brought forward,	.. ..	87153 5 2	193998 14 2	
	Third Division.—(Continued.)				
Excavation for Foundations,	3,07,577·00 cubic feet,	10-0-0 per 1000	3175 12 4		
Temporary Roads,	20 miles opened,	31·39 per mile	627 14 5		
Temporary Shelter,	2 Chowkies, with Out-offices, complete,	789·89 each	1579 12 8		
Godowns and Work-shops,	One large range at Sohawa,	594·81 each	594 13 0		
Mungola Work-shop,	A large enclosure, with Overseer's Quarters, and Saw-mill,	9,103·54 each	9103 8 8		
Catch-water Drains,	Above Cuttings,	.. ..	539 2 6		
Metal preparing,	10,000 cubic feet,	.. ..	181 4 9		
Mills,	92 ditto,	7·4 each,	684 2 2		
Groves,	Formation of Plantations,	.. .. ..	22 1 0		
Miscellaneous Works,	....	.. .. ..	148 9 3		
Experiments,	....	.. .. ..	34 12 8		
Jhelum Bridge Boats Godown,	Built near site of Bridge,	.. .. ..	953 7 6		
Repairs,	....	.. .. ..	28 9 3		
Centres of Drains,	....	.. ..	1148 8 9		
				105975 12 1	
	Fourth Division.				
Earth-work,	22,15,901·50 cubic feet,	3·34 per 1000	7408 7 8		
Masonry,	160·00 ditto,	12·00 per 100	19 3 2		
Excavation for Foundations,	4,881·00 ditto,	4·97 per 1000	24 4 5		
	Carried over,	.. .. ..	7451 15 3	299974 10 3	

LAHORE AND PESHAWUR ROAD.—*(Continued.)*

NATURE OF WORK.	Quantity of Work executed.	Average Rate.	Expenditure incurred.	Grand Total.	REMARKS.
	Brought forward, ...	.. .. ..	7451 15 3	299974 10 3	
	Fourth Division.—(Continued.)				
Temporary Shelter, ...	2 Chowkies, with Out-offices, complete, ...	583-2-8 each	1166 5 1		
Permanent 2nd Class Chowkies,	1 Chowkie commenced, ...	.. .. ..	127 12 1		
Miscellaneous Works, ...	....	.. .. ..	2 10 0		
Repairs, ...	To Earth-work & temporary Shelter,	.. .. ..	248 0 1		
Temporary Road, ...	....	.. .. ..	14 4 5	9010 14 11	
	Fifth Division.				
Earth-work, ...	1,26,75,458·00 cubic feet, ...	3·24 per 1000	41047 9 7		
Masonry, ...	2,115·00 ditto, ...	11·82 per 100	250 2 2		
Excavation for Foundations, ..	4,000·00 ditto, ...	2·5 per 1000	10 0 0		
Temporary Shelter, ...	3 Chowkies, with Out-offices, complete: one old Gun Shed fitted up, ...	.. .. ..	2257 1 2		
Permanent 1st Class Chowkies,	1 Chowkie in hand, ...	.. .. ..	318 3 6		
Ditto 2nd Class ditto, ...	2 under construction, ...	.. .. ..	722 15 0		
Experimental Metalling, ...	To ascertain cost, ...	.. .. ..	203 3 9		
Repairs, ...	To Earth-work & temporary Shelter,	.. .. ..	230 5 0		
Godowns and Work-shops, ..	An extensive range at Rawul Pindee, including Overseer's Quarters, ...	.. .. ..	2315 10 2	47355 2 4	
	Carried over, ...	.. .. ..	.. .. ..	356340 11 6	

H

Lahore and Peshawur Road.—*(Continued.)*

Nature of Work.	Quantity of Work executed.	Average Rate.	Expenditure incurred.	Grand Total.	Remarks.
	Brought forward,........	.. .. ..	....	356340 11 6	
	Sixth Division.				
Earth-work, ...	1,33,79,193·00 cubic feet,..........	5·21 per 1000	69700 13 8		
Masonry, ...	1,74,834·00 ditto, ...	13·25 per 100	23172 1 0		
Excavation for Foundations, ...	6,45,368·00 ditto, ...	5·00 per 1000	3226 13 5		
Temporary Shelter, ...	1 Chowkie complete, one in hand, and two large Sheds for work-people,......................	.. .. ..	1408 1 8		
Catch-wa[illegible] Drains, ...	On upper side of Cuttings, ...	.. .. ..	41 6 0		
Centreings for Drains, ...	....	.. .. ..	793 12 7		
Groves, ...	One Nursery commenced, ...	.. .. ..	6 8 0		
Experiments, ...	....	.. .. ..	241 8 11		
Permanent 1st Class Chowkies,	....	.. .. ..	17 7 1		
Attock Bridge Boats, ...	Six launched, nine in hand,.........	.. .. ..	13499 10 2		
Work-shops and Godowns at Khyrabad, ...	Extensive range of Shops and Godowns, with Saw Mill and Overseer's Quarters,..........	.. .. ..	10838 8 0		
Miscellaneous, ...	....	.. .. ..	497 15 4		
Repairs, ...	To temporary Shelter and to Earth-work, ...	.. .. ..	206 15 8		
Expenditure incurred in April 1853, for which detailed accounts have not as yet been received, ...	....	.. .. ..	15554 8 2		
				139214 1 8	
	Carried over,........	.. .. ..	.. .. ..	495554 13 2	

LAHORE AND PESHAWUR ROAD.—(*Concluded.*)

NATURE OF WORK.	Quantity of Work executed.	Average Rate.	Expenditure incurred.	Grand Total.	REMARKS.
	Brought forward,........	.. ..	.. .. ..	495554 13 2	
	Seventh Division.				
Earth-work, ...	21,83.993·00 cubic feet, ...	2·166 per 1000	5379 14 4		
Temporary Shelter, ...	2 Chowkies, completed with Offices,	520·265 each	1040 4 3		
Miscellaneous Earth-work, ...	Altering course of Nullahs, ...	.. .. ..	1518 0 5		
Repairs, ...	....	.. .. ..	39 13 5		
Experiments, ...	....	.. .. ..	10 12 0		
				7988 12 5	
				503543 9 7	
Salary and Establishment for Superintendence, ...	....	.. .. ..	109772 9 0		
Contingent Establishment and Ordinary Charges,........	....	.. .. ..	162781 15 10		
Advanced on account of Works in progress and Materials in store, ...	....	.. .. ..	546901 13 7		
				819456 6 5	
	GRAND TOTAL, advanced up to 30th April 1853,......			1323000 0 0	

Chief Engineer's Office,
Lahore,
The 9th September 1854.

(Signed) R. NAPIER, *Lieut.-Colonel,*
Chief Engineer, Punjab.

TABLE, No. II.

Statement showing approximately the probable cost that will be incurred subsequent to 1st February 1854, in completing the Lahore and Peshawur Road, not including the cost of Floating Bridges, or, of Metalling, to the Northward of Jhelum.

First Division.

Quantity.	Detail.	Amount.	Total.
	Earth-work, ...	22865 5 11	
1	Bridge over the Bagh Bucha, ...	20000 0 0	
1	Ditto, Kamo Nullah, ...	2500 0 0	
1	Ditto, Sealkote Nullah, ...	64500 0 0	
4	Drains, at Rs. 1081 each, ...	4324 0 0	
20	Irrigation Drains, at Rs. 770 each, ...	15400 0 0	
20	Groves, ...	13631 10 9	
1	2nd Class Chowkie, ...	3629 15 2	
1	Turfing Slopes, ...	7458 7 4	
1	Repairs to Earth-work before Metalling is laid down, ...	8788 0 0	
1	Office Chowkie, at Goojeranwala, ...	6729 15 2	
59·146	Miles of Metalling, at Rs. 3829·71 per mile,	226510 8 10	
59	Mile Stones, at Rs. 60 each,...	3540 0 0	
			399877 15 2
	Deduct outstanding Balance on 1st February 1854,...	....	89409 0 0
	Probable Cost of completing, Co.'s Rs., ...	....	310468 15 2

Second Division.

Quantity.	Detail.	Amount.	Total.
3085·168	Cubic feet of Earth-work in Embankments on the Chenab, at Rs. 5-8,...	16968 0 0	
1969·296	Ditto ditto, Jhelum, at Rs. 3-8, ...	6893 0 0	
	Ditto Kharian Pass, ...	8000 0 0	
200·000	Cubic feet widening cut at Jhundawala, at Rs. 3-8, ...	700 0 0	
4400	Running feet of Parapet Walls on Embankments in Kharian Pass, at 8·5 cubic feet of Masonry per foot run: =37·400 cubic feet, at Rs. 6 each, ...	2244 0 0	
1	Drain in Pass, at Rs. 500, ...	500 0 0	
	Balance required to complete Well, ...	500 0 0	
	Lengthening Break-water at Bridge No. 2,	270 0 0	
	Balance required to complete Bridge No. 6,	1800 0 0	

SECOND DIVISION.—*(Continued.)*

Quantity.	Detail.	Amount.			TOTAL.		
	Bridge at Jhundawala, ...	2500	0	0			
	Ditto at Punjun, ...	1400	0	0			
4	Irrigation Drains, at Rs. 770 each,... ..	3080	0	0			
60	Drains at Corners of Embankments and Cuttings, at Rs. 70 each, ...	4200	0	0			
30	Small Drains on Embankments, with Parapet Walls, at Rs. 25 each,...	750	0	0			
2	2nd Class Chowkies, at Rs. 4,000 each, ...	8000	0	0			
5	Groves, at Rs. 100 each, without Maintenance, ...	500	0	0			
18	Maintenance of all Groves for 5 years, at Rs. 360 each, ...	6480	0	0			
10	Miles of Metalling, at Rs. 5,703 per mile,...	57030	0	0			
16	Ditto ditto, at Rs. 10,895 per mile, ..	174320	0	0			
40	Mile Stones, at Rs. 50 each, ...	2000	0	0			
12½	Miles of Metalling, at Rs. 6,126 per mile,...	76575	0	0			
4	Ends to Spurs of Chenab and Jhelum Embankments, at Rs. 350 each, ...	1400	0	0			
2	Ends to embanked Road, at Rs. 1,000 each,	2000	0	0			
					378110	0	0
	Deduct outstanding Balance on 1st Feb. 1854, ...	....			69695	0	0
	Probable Cost of completing, Co.'s Rs., ...	....			308415	0	0

THIRD DIVISION.

Quantity.	Detail.	Amount.			TOTAL.
7674·636	Cubic feet Earth-work in Section No. 6, at Rs. [illegible] per 1,000 cubic feet, ...	46048	0	0	
11096·225	Ditto, not including Tunnel in Section 5, at Rs. 6 per 1,000, ...	66577	0	0	
2376·000	Cubic feet Earth-work in Section No. 3, at 5 per 1,000,...	11880	0	0	
626·000	Cubic feet Excavation for Tunnel, at Rs. 20.	1253[illegible]	0	0	
4821·600	Cubic feet ditto in Trenches above Cutting, at Rs. 5, ...	24108	0	0	
	Catch-water Drains, ditto, ...	10000	0	0	
	Miscellaneous Special Cuttings, ...	5000	0	0	
	Turfing Slopes, ...	7000	0	0	
36	Mile Stones, at Rs. 40 each,...	1440	0	0	
30	Drains, common, at Rs. 1,200 each, ...	36000	0	0	
	Deenah Nullah Timber Bridge, 200 feet span, at Rs. 213 per foot,...	42600	0	0	
	Bukrala ditto ditto, 400 feet, at Rs. 250 per foot, ...	100000	0	0	
	Boora Jungle Bridge, of 20, 2000 0 0				
	Deep Culvert near Bukrala, 8000 0 0				
		10000	0	0	

THIRD DIVISION.—*(Continued.)*

Quantity.	Detail.	Amount.	TOTAL.
400	Running feet of Bridge between Pind and Goojer Khan, at Rs. 370 per foot, ...	148000 0 0	
5	Irrigation Drains, at Rs. 781 each,... ...	3905 0 0	
3	2nd Class Chowkies, at Rs. 4,000 each, ...	12000 0 0	
18	Groves, at Rs. 1,075 each, ...	19350 0 0	
100	Drains at Corners, between Cuttings and Embankments, at Rs. 70 each, ...	7000 0 0	
186	Drains on Embankments, with Parapet Walls, at Rs. 25 each, ...	4650 0 0	
5	Ditto Cross, in deep Cuttings and long, at Rs. 500 each, ...	2500 0 0	
373·00	Running feet Parapet Walls on Embankments, containing cubic feet 3171·50, at Rs. 6 per 1,000 dry stone, ...	19029 0 0	
1706·60	Cubic feet Masonry in Tunnel, at Rs. 25 per 100, ...	42265 0 0	
			631882 0 0
	Deduct outstanding Balance on 1st February 1854,...	....	95552 0 0
	Probable Cost in completing, Co.'s Rs., ...	....	536330 0 0

FOURTH DIVISION.

Quantity.	Detail.	Amount.	TOTAL.
1953·934	Cubic yards in the Fourth Division, not including descent to Sohan, equalling 52756218 cubic feet of Excavation and Embankments, at Rs. 5, ...	263780 0 0	
	Descent to the Sohan, 4500000 cubic feet, about, ...	45000 0 0	
4261·200	Cubic feet Excavation in Trenches over Cuttings, at Rs. 5,...	21306 0 0	
2131·600	Cubic feet Catch-water Drains, at Rs. 5, ...	10658 0 0	
	Miscellaneous Special Cuttings, ...	5000 0 0	
	Turfing Slopes, ...	8000 0 0	
32	Mile Stones, at Rs. 50 each, ...	1600 0 0	
43	Drains, common, at Rs. 1,400 each, ...	60200 0 0	
1	Double 9½ feet Culvert, at Burra Cheeanee,	8000 0 0	
1	Bridge over Chota Cheeanee Nullah, ...	24000 0 0	
2	2nd Class Chowkies, at Rs. 4,000 each, ...	8000 0 0	
15	Groves, at Rs. 1,270 each, ...	19050 0 0	
100	Drains at Corners of Embankments and Cuttings, at Rs. 70 each,...	7000 0 0	
41	Small Drains on Embankments, with Parapet Walls, at Rs. 20 each, ...	820 0 0	

FOURTH DIVISION.—*(Continued.)*

Quantity.	Detail.	Amount.			TOTAL.		
8080	Running feet Parapet Walls on Embankments, at 8·5 cubic feet per running foot, 68680 cubic feet, at Rs. 16 per 100 cubic feet, ...	10989	0	0			
10	Cross Drains, in deep cuttings, at Rs. 500 each, ...	5000	0	0			
	Leia and Sohan Timber Bridges, ...	300000	0	0			
					798403	0	0
	Deduct outstanding Balance on 1st February 1854, ...	....			41500	0	0
	Probable Cost of completing, Co.'s Rs., ...	....			756903	0	0

FIFTH DIVISION.

Quantity.	Detail.	Amount.			TOTAL.		
	Earth-work in Section No. 1, ...	5000	0	0			
	———— Margulla Cutting, ...	11225	0	0			
	———— Section No. 3, ...	7000	0	0			
	———— Section No. 5, ...	4000	0	0			
	Catch-water Drains, ...	6620	0	0			
	Side Trenches over Cuttings, ...	7000	0	0			
	Turfing Slopes, ...	7000	0	0			
8	Bridges, ...	90000	0	0			
29	Drains and Culverts, ...	29000	0	0			
20	Irrigation Drains, at Rs. 780 each, ...	15600	0	0			
	Embankment Drainage, ...	5000	0	0			
	Parapet Walls on Embankments, ...	12000	0	0			
	2nd Class Chowkie, ...	4500	0	0			
2	Nurseries for young Trees for Groves, ...	600	0	0			
15	Groves, ...	16000	0	0			
29	Mile Stones, ...	1450	0	0			
					221995	0	0
	Deduct outstanding Balance on 1st February 1854, ...	....			41500	0	0
	Probable Cost of completing, Co.'s Rs., ..	....			180495	0	0

SIXTH DIVISION.

Quantity.	Detail.	Amount.			TOTAL.		
43677·036	Cubic feet Earth-work, at Rs. 4-8 per 1,000 cubic feet, ...	196517	0	0			
2600·000	Cubic feet Catch-water Drains, ...	11700	0	0			
	Miscellaneous Drainage Cuts, ...	5000	0	0			
	Turfing Slopes, ...	8000	0	0			

Sixth Division.—*(Continued.)*

Quantity.	Detail.	Amount.	Total.
34	Mile Stones, at Rs. 60 each, ...	2040 0 0	
29	Bridges, at Rs. 7,600 each, ...	220400 0 0	
51	Drains, common, at Rs. 1,000 each, ...	51000 0 0	
2	2nd Class Chowkies, at Rs. 4,000 each, ...	8000 0 0	
17	Groves, at Rs. 1,200 each, ...	20400 0 0	
50	Drains, at corners of Cuttings and Embankments, at Rs. 70 each, ...	3500 0 0	
75	Small Drains on Embankments, with Parapet Walls, at Rs. 25 each, ...	1875 0 0	
7478	Running feet of Embankment, requiring Parapet Walls, dry stone, ... 17 Cubic feet per running foot = 1,27,126, at Rs. 6 per 1,000, ...	7628 0 0	
330·00	Cubic feet Masonry, in Side Drain, in Herrot Cutting, at Rs. 16 per 100, ...	5280 0 0	
	Timber Bridge on Shumshabad Nullah, 200 feet span, ...	40000 0 0	
			581370 0 0
	Deduct outstanding Balance on 1st February 1854,...	....	208883 0 0
	Probable Cost of completing, Co.'s Rs. ...	....	372487 0 0

Seventh Division.

Quantity.	Detail.	Item sum	Amount.	Total.
8021025	Cubic feet Earth-work in Section No. 1, mostly Shingle, at Rs. 6 per 1,000, ...		48126 2 5	
10428129	Ditto in Section No. 2, at Rs. 5-8,... ...		46954 9 3	
	12402909 in Section No. 3. 7616322 ditto No. 4. 20019231 Total. 12000000 deduct already executed.			
8019231	Cubic feet Earth-work, at Rs. 4-12, ...		38091 5 6	
1203960	Cubic feet Earth-work in Trenches above Cuttings, at Rs. 6, ...		7223 12 4	
	Special Cuttings No. 1, ...	2000		
3000000	Cubic feet Cuttings near Tarn, at Rs. 4, ...	12000		
5000000	Cubic feet Cuttings, near Khudergail, at Rs. 5, ...	25000		
1500000	Cubic feet Cuttings, at Bridges Nos. 25 and 26, at Rs. 4, ...	6000		
750000	Cubic feet Cuttings, at Bridge No. 11, at Rs. 4, ...	3000		
1500000	Cubic feet Cuttings, at Bridges Nos. 7 and 8, at Rs. 4	6000		
	Cubic feet Cuttings, at Bridge No. 1,	2000		
			56000 0 0	

SEVENTH DIVISION.—(*Continued.*)

Quantity.	Detail.	Amount.	TOTAL.
	Catch-water Drains over Cuttings, ...	3000 0 0	
	Turfing Slopes, ...	6000 0 0	
33	Mile Stones, at Rs. 60 each, ...	1980 0 0	
78	Drains, common, at Rs. 1,250 each, ...	97500 0 0	
40	Bridges, at Rs. 8,400 each,...	336000 0 0	
120	Neemchucks, at Rs. 80 each, ...	9600 0 0	
1200	Running feet of Block Sinking, at Rs. 12 per running foot, ...	14400 0 0	
1	Bridge over the Bara River, ...	40000 0 0	
12	Irrigation Drains, at Rs. 781 each, ...	9372 0 0	
3	2nd Class Chowkies, at Rs. 4,000 each, ..	12000 0 0	
17	Groves, at Rs. 1,057 each, ...	17969 0 0	
88	Drains at Corners between Cuttings and Embankments, at Rs. 50 each, ...	4400 0 0	
10	Drains to Drain Cuttings, at Rs. 550 each,	5500 0 0	
			754116 13 6
	Deduct outstanding Balance on 1st February 1854, ...	....	63212 0 0
	Probable Cost of completing, Co.'s Rs. ...	....	690904 13 6

ABSTRACT.

First Division, ...	310468 15 2
Second ditto, ...	308415 0 0
Third ditto, ...	536330 0 0
Fourth ditto, ...	756903 0 0
Fifth ditto, ...	180495 0 0
Sixth ditto, ...	372487 0 0
Seventh ditto, ...	690904 13 6
	3156003 12 8
Deduct Amount of Assignments in deposit in the Jhelum and Rawul Pindee Treasuries, on the 1st February 1854, ...	481342 12 5
Balance required, ...	2674661 0 3

(Signed) A. TAYLOR, *Lieutenant,*
Superintendent, Lahore and Peshawur Roads.

(Signed) R. NAPIER, *Lieut.-Colonel,*
Chief Engineer, Punjab.

Chief Engineer's Office,
Lahore,
The 9th September 1854.

TABLE, No. III.

Table showing the task expected from each laborer in the Fourth and Fifth Divisions, Lahore and Peshawur Road, to be excavated and wheeled.

Task for each man under 50 yards lead, according to the hardness of the soil, commencing at ordinary soil and ending at rocky soil.	Task for 10 Getters and Fillers, with proportion of Wheelers, as shown in each column.	At 50 Yards.			At 100 Yards.			At 150 Yards.			At 200 Yards.			At 250 Yards.			At 300 Yards.		
		Getters and Fillers.	Wheelers.	Total.	Getters and Fillers.	Wheelers.	Total.	Getters and Fillers.	Wheelers.	Total.	Getters and Fillers.	Wheelers.	Total.	Getters and Fillers.	Wheelers.	Total.	Getters and Fillers.	Wheelers.	Total.
100	1666	10	6·6	16·6	10	13·3	23·3	10	20·0	30·0	10	26·6	36·6	10	33·3	43·3	10	40·0	50·0
90	1363	10	5·4	15·4	10	10·9	20·9	10	16·3	26·3	10	21·8	31·8	10	27·3	37·3	10	32·7	42·7
80	1176	10	4·7	14·7	10	9·4	19·4	10	14·1	24·1	10	18·8	28·8	10	23·5	33·5	10	28·2	38·2
70	972	10	3·7	13·7	10	7·8	17·8	10	11·6	21·6	10	15·6	25·6	10	19·5	29·5	10	23·4	33·4
30	341	10	1·36	11·36	10	2·72	12·72	10	4·08	14·08	10	5·44	15·44	10	6·8	16·8	10	8·16	18·16
25	277	10	1.1	11·1	10	2·2	12·2	10	3·3	13·3	10	4·4	14·4	10	5·5	15·5	10	6·6	16·6

Chief Engineer's Office,
Lahore,
The 9th September 1854.

(Signed) R. NAPIER, *Lieut.-Colonel,*
Chief Engineer, Punjab.

TABLE, No. IV.

Table showing the task expected from each man on the Lahore and Peshawur Road, to be excavated and carried for distances from 75 Yards to 30 Yards.

Task according to soil under 50 yards lead, commencing at ordinary soil and ending at rocky soil.	75 Yards. Lead.	100 Yards. Lead.	125 Yards. Lead.	150 Yards. Lead.	175 Yards. Lead.	200 Yards. Lead.	225 Yards. Lead.	250 Yards. Lead.	275 Yards. Lead.	300 Yards. Lead.
C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.	C. Ft.
100	86	72	64	56	51	46	42	38	35	33
90	77	65	58	52	47	43	39	36	34	32
80	71	61	55	49	45	41	38	35	33	31
70	62	55	50	45	41	38	35	33	31	29
30	28	26½	25	24	23	22	21	20⅓	19¼	18½
25	24	22½	21¾	21	20	19	15½	18	17½	17

(Signed) R. NAPIER, *Lieut.-Colonel,*
Chief Engineer, Punjab.

Chief Engineer's Office,
Lahore,
The 9th September 1854.

TABLE, No. V.

Table showing the comparative cost of laying down 160 superficial feet of one layer of Metal (Kunkur,) 4½ inches thick, loose, in the Fifth Division G. T. Road, and in different Divisions of the Lahore and Peshawur Road.

	Fifth Division, G. T. Road.			First and Second Division, L. P. Road.			Third Division, L. P. Road.			Fourth, Fifth and Sixth Divisions, L. P. Road.			Seventh Division, L. P. Road.			
	No.	Rate.	Amount.	No.	Rate.	Amount.	No.	Rate.	Amount.	No.	Rate.	Amount.	No.	Rate.	Amount.	
Mate Coolies, ...	0·32	0-2-0	0·64	0·32	0-3-0	0·96	As before.	0-3-0	0·96	As before.	0-4-0	1·28	As before.	5·12	1·64	The total column shows the cost with our rates of labor applied to the G. T. Road quantities. The second total is a slight increase on the first, because boys are not procurable in numbers, and boys, are no doubt a cheap kind of labor.
Gang Leader, ...	0·32	0-1-9	0·56	0·32	0-2-3	0·72		0-2-9	0·88		0-3-0	0·96		4·00	1·28	
Coolies, ...	2·133	0-1-6	3·20	3·177	0-2-0	6·35		0-2-6	7·94		0-3-0	9·53		3·52	11·18	
Ditto, ...	1·044	0-1-3	1·39													
Boys, ...	2·4	0-1-0	2·40	2·4	0-1-0	2·40		0-1-6	3·60		0-1-6	3·60		2·00	4·80	
Total Annas, ...			8·19			10·43			13·38			15·37			18·90	
Corrected, ...			8·19			11·00			14·13			16·12			20·00	
Rate per Mile, ...	270·27			363·00			466·29			531·96			660·00			Single layer.
Rate per Mile, two layers, ...	540·54			726·00			932·58			1063·92			1320·00			
Proportionate costs of labor in different Divisions, Labor, First Division being 1, ...							1 to 1·312			1 to 1·497			1 to 1·857			
Proportionate rates Grand Trunk Road being 1, ...				1 to 1·34			1 to 1·73			1 to 1·97			1 to 2·44			

Chief Engineer's Office,
Lahore,
The 9th September 1854.

(Signed) R. NAPIER, *Lieut.-Colonel,*
Chief Engineer, Punjab.

TABLE, No. VI.

No. 1.—*Statement of Rates on Expenditure to* 1*st May* 1853.

WORK AND MATERIALS.

WORK.	First Division.	Second Division.	Third Division.	Fourth Division.	Fifth Division.	Sixth Division.	Seventh Division.	Average of all the Divisions.	REMARKS.
Earth-work, per 1,000 cubic feet,	2·066	2·414	*4·630	3·340	3·240	5·210	2·160	3·294	*Including blasting in rock.
Excavation, ditto, ...	3·000	3·250	*10·000	4·970	2·500	5·000	......	4·787	
Masonry, per 100 cubic feet,......	11·650	15·216	12·130	12·000	11·820	13·250	......	12·677	
Stocking Metal near the road, per 100 cubic feet, ...	......	8·110	......	......	......	......	......	......	
Ditto Quarry ditto,..................	......	1·200	......	......	......	......	......	......	
Preparing Metal ditto, ...	......	......	1·813	......	......	......	......	......	

No. 2.—Rates of Labor on the Lahore and Peshawur Road, as compared with that of a portion of the Grand Trunk Road.

LABORERS.	Fifth Division, G. T. Road.	First Division, L. and P. Road.	Second Division.	Third Division.	Fourth Division.	Fifth Division.	Sixth Division.	Seventh Division.
	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.
Mate Coolies, per diem, ...	2-0	3-0	3-0	3-0	4-0	4-0	4-0	5-1½
Gang Coolies, ...	1-9	2-3	2-3	2-9	3-0	3-0	3-0	4-0
Coolies, ...	1-6 }	2-0	2-0	2-6	3-0	3-0	3-0	3-6
Ditto,............................	1-3 }							
Boys,...........................	1-0	1-0	1-0	1-6	1-6	1-6	1-6	2-0

No. 3.—Rates of probable additional Expenditure that will be necessary to complete the work.

WORK.	First Division.	Second Division.	Third Division.	Fourth Division.	Fifth Division.	Sixth Division.	Seventh Division.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Metalling, per mile,...	3,830	7,998	......	...	......	...	....
Earth-work, Excavation, } p. 1,000 cubic ft.	...	3-8 to 5-8	5 & 6	5	4-8	...	4-12, 5-8 & 6
Tunnel Excavation, per. 1,000 cub. ft.,...	...	....	20	...	......	...	....
Tunnel Masonry, per 100 cubic feet,......	...	....	25	16	......	16	....
Dry Masonry, per 100 cubic feet, ...	...	6-0 to 8-8	6	...	......	6	....
Block Sinking, per running foot, ...	...	....	......	...	......	...	12
Mile Stones, each, ...	60	50	40	50	50	60	60

(Signed) R. NAPIER, *Lieut.-Colonel,*
Chief Engineer, Punjab.

Chief Engineer's Office,
Lahore,
The 9th September 1854.

APPENDIX.

MEMORANDUM BY LIEUT. COL. R. NAPIER.

It was not my intention to include the several totals into one sum. I meant the roads in progress to be those on which digging was commenced.

The several totals do not make a true aggregate as they stand, and yet they do make a true one of the

834 in progress,
2,736 surveyed,
827 traced.

Some of the traced are included in the surveyed, for they were surveyed *all* before being traced—they were traced before being put in progress—but again, many now put as in progress, were traced and surveyed before last Report, and though the number of miles opened is given as the present states, the number traced and surveyed are only since last Report. I perceive that the heading does not sufficiently specify this.

But from the accompanying Statement, you will see that including roads surveyed, that is, including, not all the miles of survey, but the miles of road determined by surveys, there have been 4,416 miles of road commenced, which is an honest fraction above "4,400 *nearly*."

Total commenced in miles,	7,796
Add Canal roads not included in above,	220
Total miles commenced,	8,016
Since annexation opened up to date,	3,600
Balance commenced,	4,416

(Signed) R. NAPIER.

Appendix A.

Surveyed or traced.

	M.	F.	Y.
Murree to Bunneegully, ...	14	0	0
Mandra to Chukowal, ...	56	0	0
Thutta to Tubbur,..	18	2	0
Salt line—Attock to Pind Dadun Khan,..	100	0	0
Surae Sidhoo to Kumeerla, ...	14	0	0
Fazilshah to Tubba, ...	14	4	0
Chukowal to Jhelum, ...	63	0	0
Ditto to Neelah,..	48	3	0
Abottabad to Mozufurabad, ...	51	2	0
Ditto to Murree, ...	20	0	0
Shinkeearee to Balakote, ...	4	0	0
Meerpoor to Munseerah, ...	10	0	0
Kusoor to Chuniote, ...	40	4	0
Ditto to Mamookee, ...	60	3	0
Attock to Neelah, ...	112	0	0
Turrun Tarun to Hurreekee, ...	3	4	0
Futtehjung to Khooshialgurh, ...	48	0	0
Umritsur to Hurreekee Ghât, ...	51	0	0
Tullahgung to Chukowal, ...	46	4	0
Googairah to Syudwallah,..	46	3	0
Fazilshah to Jhung, ...	36	4	0
Pind Dadun Khan to Ramnuggur, ...	42	4	0
Sheikhoopoora to Ramnuggur, ...	45	4	0
Tullahgung to Kallabagh,..	31	0	0
Kamokee to Sheikhoopoora,..	22	0	0
Surveys in Bareo Doab, ...	21	3	0
Lahore to Hurreekee Ghât, ...	58	5	0
Surveys in Jhelum, ...	75	0	0
	1,156	1	0

Appendix B.

District Roads.

Districts.	Done by C. E. D. but not included with Lieut. Nightingale's returns.	Done by District Officers.	
Lahore, ...	0 0 0	4 0 0	Appearing in Lieutenant Nightingale's Returns, 999.
Sealkote, ...	116 0 0	29 4 0	
Goojeranwallah, ...	40 7 0	0 0 0	
Goordaspoor, ...	18 0 0	103 0 0	
Derah Ghazee Khan, ...	42 0 0	0 0 0	
Khangurh, ...	15 0 0	0 0 0	
Leiah, ...	0 0 0	225 0 0	
Huzara, ...	0 0 0	0 0 0	
Peshawur, ...	0 0 0	0 0 0	
Mooltan, ...	0 0 0	336 7 0	
Googaira, ...	200 0 0	0 0 0	
Jhung, ...	39 6 0	0 0 0	
Jhelum, ...	197 2 0	0 0 0	
Goojerat, ...	74 0 0	0 0 0	
Rawul Pindee, ...	0 0 0	8 0 0	
Shahpoor, ...	0 0 0	0 0 0	
	748 7 0	706 3 0	

Appendix C.

Derajat Roads.

				Commenced on Miles.		
Entered in Statement VIII. of last Road Report,....				605	0	0
Deduct the following entered in Report of 1852:—						
Lukkee to Peyzoo, ...	18	0	0			
Peyzoo to Dubrah, ...	20	0	0			
Tank to Roree,..	11	0	0			
Koolachi to Roree, ...	10	4	0			
Ditto to Ruttee,..	17	0	0			
Saggoo to Chondwan, ...	21	4	0			
Viddore to Hurrund, ...	37	6	0			
Dubrah to Vehoa,......	76	0	0			
Derah Ishmael Khan to Drabund, ...	33	4	0			
Peyzoo to Derah Ishmael Khan,..	34	6	0			
Hurrund to Shahwullee, ...	84	0	0			
				364	0	0
Remaining,..				241	0	0

Appendix D.

Peshawur and Huzara Roads.

Districts.	By survey of this Department.	Without survey of this Department.
Peshawur, ...	33	55
Huzara, ...	0	14
	33	69
		33
		Total, ... 102 Miles.

Roads in Kohat, as detailed in next page,............ 143 Miles.

	Commenced on Miles.
Kohat and Bunnoo Road,..	78
Kohat and Khooshalgurh,..	32
Kohat Kothul Road,..	5
Kohat to Hungoo,..	28
Total, Miles, ...	143

Appendix E.

Detached Surveys and Work by Lieutenants Morrison, Packe, &c.

	Miles.
Road from Torbeila to Rah, ...	146
Kallakeh Suraee to Hurreepoor,..	20
Hurreepoor to Nowsherah, ...	21
Miles,...............	187

Appendix F.

Canal Roads.

7,90,862 feet in length }
and 3,73,737 " " " } or 220 Miles.

Abstract.

Road Statement.

				Commenced on Miles.		
By the Report of 1852, there were				4,512	0	0
Add—						
Actual lengths of road, for which Lieutenant Nightingale has since made surveys, as per List A., ...	1,156	0	0			
District roads not included in above, surveyed by this Department and made by District Officers, as per Statement B.,..	748	7	0			
District roads, made by District Officers without survey by this Department, as per Statement B.,	706	3	0			
Additional Derajat Roads made, not included in Lieutenant Nightingale's return, as per Statement C., ...	241	0	0			
Additional roads made in Peshawur and Huzara, not included in Lieutenant Nightingale's returns, *vide* Statement D.,..	102	0	0			
Roads in Kohat, as per Statement D., ...	143	0	0			
Detached Surveys and Work, by Lieutenants Morrison, Packe, &c., as per Statement E., ..	187	0	0			
				3,284	0	0
Total commenced on .. .. Miles				7,796	0	0
Deduct Roads open for traffic, according to last Report, ... ,,				3,600	0	0
Remaining in progress,.. .. .. Miles				4,196	0	0
Add Baree Doab Canal roads, as per Statement F., .. ,,				220	0	0
Total, Miles.....				4,416	0	0

(Signed) R. NAPIER, *Lieut.-Col.*,
Chief Engineer.

THOS. JONES, "CALCUTTA GAZETTE" OFFICE.

(Copy.)

No. 4924 of 1854-55.

From

Lieut.-Colonel R. NAPIER,

Chief Engineer, Punjab.

To

R. TEMPLE, Esquire,

Secy. to the Chief Commissioner, Punjab,

Dated Lahore, the 8th January 1855.

Civil General.

Sir,

Lieutenant Taylor's letter No. 1840 of the 4th January 1855.

In my report on the Lahore and Peshawur Road, dated 9th September 1854, I omitted the name of Captain Bowden from amongst the names of other Officers particularly noticed. This omission was unintentional injustice to Captain Bowden. It has been brought to my notice by Lieutenant Taylor, Superintendent of the Lahore and Peshawur Road, who informs me he has looked upon the Sub-division of the Peshawur Road under Captain Bowden, as the model Sub-division of the road, I therefore beg that the Chief Commissioner will permit me now to do justice to Captain Bowden, who highly deserves commendation for zeal and activity, by forwarding this letter to the Supreme Government.

I have, &c.,

(Signed) R. Napier, Lieut.-Colonel,

Chief Engineer, Punjab.

Chief Engineer's Office;
Lahore,
The 8th January 1855.

(True Copy)

(Signed) R. Temple,

Secretary.

